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The Platform of American Industry

PUBLIC policy is so intimately related to private prosperity that industry has followed with deep interest the major political parties in their traditional efforts to enunciate principles and to define the several issues of national moment. That American business should have a voice in formulating political platforms is obvious to all except the politician and the demagogue. Industry is the instrument responsible for production and the welfare and material progress of all who are engaged therein.

In recognition of this responsibility a special committee including in its personnel such leaders of chemical engineering industry as Henry Howard of the Grasselli Chemical Co., Charles W. Brown, president of the Pittsburgh Plate Glass Co., and Frederick C. Hood, president of the Hood Rubber Co., was recently appointed by the National Association of Manufacturers and asked to represent the industry of the nation. The committee presented views formulated by a hundred industrial leaders from all parts of the country and in every phase of productive enterprise. To summarize here their platform of American industry is obviously impossible; we must content ourselves with a few of its succinct declarations:

Government and Business. "We urge more reliance upon private energy and character and less upon public law and appropriation."

Public Honesty. "American industry requires the highest standard of public and private morality and demands that every possible power be exercised to insure that high plane which is essential to the permanence of a constitutional and representative government."

Taxation. "If we are not to undermine the financial structure upon which all prosperity depends, we must limit the use of taxing power and base our national policies upon fundamental economic laws."

Regulation of Combinations. "There is no more important duty of government than clearly to define and encourage legitimate organization while firmly and effectively protecting society against its misuse."

Transportation. "Industry is vitally concerned with the maintenance of efficient transportation. Economical operation can only be had under private ownership and control."

Immigration. "Unrestricted immigration is an unmixed evil. We favor the highest selective tests for admission of aliens, the number to be determined in terms of political assimilability and demonstrated economic requirement."

Such is the stand of American industry—an unselfish, non-political enunciation on the principal issues confronting the nation. It is counsel worthy of thoughtful consideration not alone by those responsible for party platforms but by the greater number interested in industry's contribution to the common welfare.

When Dye Maker Turns Entomologist

OUR publication last week of W. Lee Tanner's brief account of some recent developments in the fumigation of citrus trees served to direct attention to an important but little known phase of the dye industry. In emphasizing the close relation of dyes to medicine and to the national defense most of us have overlooked the fact that for some time the industry has been engaged in the development of other important fields for its products. The contributions made to agriculture, for instance, are indicative of both the enterprise and the potentiality of organic chemical manufacturing.

Some months ago we were rather mildly surprised to find on the research staff of one of our dye-manufacturing plants a small group of distinguished entomologists. They were studying the practical application of certain dye intermediates as fungicides and specific remedies for plant diseases. Their work began where the chemical engineer's ended. In the product of his manufacture they were able to find useful properties leading to applications different indeed from those for which the product was originally intended.

An example of this sort of development may be observed in the case of paradichlorbenzol, which incidentally happens to be an ingredient with phenarsazine chloride and methyl dichloramine in the fumigating mixture described by Mr. Tanner. It will be recalled that in chlorinating benzol during the war to obtain the monochlorbenzol, which was necessary in tremendous quantity in order to produce our military requirements of picric acid, considerable dichlorbenzol accumulated as a byproduct. The Dye Census of 1918 did not evaluate this output, because "few manufacturers separated or weighed this product or kept any record of its production." In 1919, following a decrease of 80 per cent in the production of monochlorbenzol, the Tariff Commission reported an output of 130,864 lb. of paradichlorbenzol, valued nominally at 7c. per lb. During 1920, 465,292 lb. was reported at an average price of 9c. per lb.

It was about this time, however, that a considerable change took place in the status of this byproduct. "Paradichlor" was found by Blakeslee and Quaintance of the U. S. Bureau of Entomology to be a specific protection against the ravages of the peach borer. As little as an ounce of the material was sufficient on the average to prevent the peach borer from attacking and seriously injuring a tree. This discovery was rapidly reduced to practice by the chemical manufacturers. Its immediate effect could be seen in the 1921 census, when the average price of the product had mounted to 16c. per lb. This level has been maintained fairly steady ever since and we find present-day quotations 18c to 20c. But this instance is not cited because the in-

creased return to the dye maker is particularly significant, for after all the price of the material is negligible compared with its value to the orchardist. Rather it shows how almost overnight a byproduct of the dye industry can become a commodity of economic importance.

When one considers the startling total of the annual damage done to crops by the great variety of insect pests, fungus growths and parasites, it is apparent that we are only at the beginning of our effort at scientific extermination. The important work that our more progressive dye manufacturers are pushing to the best of their ability has in it the promise of great economic benefit. Success in this direction will establish more forcibly than any propaganda the key importance of the organic chemical industry.

What About the Man With No College Degree?

A PENNSYLVANIA correspondent reminds us of a situation which he describes as "not uncommon but very unfair." His plea is for the man who never entered college or who has not finished his college education and is, therefore, forced to take up industrial work minus an alphabetical appendage of degrees. Many of these men possess great ability, according to our correspondent, and yet in almost every case to his knowledge the man with the degree obtained the position or the advancement. The other man "never had a chance."

This is an attitude that is not widely prevalent and it is fortunate that it is not, for the observations upon which it is based are not accurate. In production work there has been, if anything, a differentiation against rather than in favor of the man with the college degree. We believe that this unfavorable discrimination is diminishing and that the reason for the improved status of the college graduate is his better average efficiency.

In our experience we can recall many spectacular promotions of non-college men to positions of importance over the heads of college graduates. It was in almost every case on merit alone. Our correspondent may object by saying that in such cases the merit was so apparent that it could not be disregarded but that in cases where the qualifications were nearly equal the college degree would win out.

This may be true. We hope that it is, for in our opinion a college man ought to be able to fill a given job better if other things are equal. It is not so much the college degree, nor yet the specific training in professional subjects that swings the balance. It is the great advantage of having lived in an environment that inevitably teaches one how to meet men, how to make friends and how to get a perspective on the problems that must be faced.

To those men who have not had the opportunity of college training the lack of these things is likely to prove more of a handicap than unfamiliarity with particular subjects, for these can usually be mastered in the course of a few months study.

We indorse heartily our correspondent's plea for fair play. Never ought preference to be given to the degree holder without a most careful review of the more essential qualifications. But basing our belief on observations of the past decade, we can predict with complete confidence the gradual displacement of the non-college man from the technical and executive posi-

tions in production work. This is not an expression of personal preference. It is merely an extrapolation of a curve that has already assumed definite shape. There are fewer non-college men in production work than there were formerly. The trend is continuing unabated and it will approach 100 per cent asymptotically. It is a case of the survival of the fittest.

An Enduring Monument To a Great Pioneer

THE death of Horace M. Swetland has deprived industry of a great leader. As publisher of such journals as *Iron Age*, *Dry Goods Economist*, *Automotive Industries* and many others he built securely into the very foundations of the industries that his publications served.

Workers in industry, whether they be presidents and high officials, engineers and technologists, or salesmen and merchandisers, will do well to consider his work and to honor him for the part he played in building up modern industries. When he entered the publishing field more than 40 years ago business journalism was embryonic. Those were the days when the pirate space buyer used the advertising pages of the business paper as a speculation. There was little thought of serving the advertiser, of helping him to build up sales, of planning marketing campaigns, of aiding him with technical advice. All of these things have been developed and added since Swetland became associated with *Power* in 1884. One of the principal reasons for the accomplishment of such results was his unwavering idealism.

Similarly, editorial work has been changed fundamentally from those early days when the editorial space in many publications was for sale almost as openly as the advertising pages and when editorial ethics were non-existent. Gradually and because of men like Swetland, editorial service to the reader was born. Today it is presupposed. No business pressure dominates editorial activity. Swetland and his fellow leaders have made it impossible and have thus created modern business journalism as a profession and as a service.

It is unnecessary to estimate the importance of the business paper to industry. It is self-evident. The relationship is intimate and essential. As a vital tool, as a medium of friendship, as a stabilizer and as a prophet, the business paper stands as an ideal memorial to Swetland, a leader in its development.

Bettering Conditions In the Patent Office

LACK of personnel and lack of adequate space have been the two serious problems of the Patent Office during recent years. A year ago Congress authorized an increase in the number of patent examiners and thus gave much needed relief in that particular. Very recently the Congressional commission on space for government departments has acted favorably upon the request of the Commissioner of Patents, Thomas E. Robertson, for additional space allotments. The Commissioner, therefore, finds himself for the first time in many years in a position to put into effect much needed rearrangement of the Patent Office.

The chemical industries will profit particularly in this rearrangement, for it now becomes possible for the

Commissioner to assemble in one group the sections dealing with industrial chemistry, with dyes and organic chemicals, and with the other chemicals and chemical processes which the complexity of modern chemical industry requires to be closely associated. In other lines, too, closely related divisions can now be housed near together, to the great advantage of the office and of all applicants for patents. This should make for increased promptness in handling cases, as well as for more accurate attention to all phases of each new case as it arises. Personal association and conferences of the examiners in closely related work are indeed essential for both these ends.

The next requirement of the Patent Office is either an entirely new building or extensive remodeling and improvement of the present structure. Conditions in the present building are intolerably dangerous to irreplaceable government records. They are almost unbelievably inadequate from the standpoint of comfort, health and efficiency of the technical staff. It is important, therefore, that Congress and the Budget Bureau co-operate in the permanent improvement of Patent Office building and facilities. The temporary advantages gained from larger staff and more nearly adequate space are welcome, but they should not be regarded as permanently satisfactory. Fortunately influential members of Congress and the authorities of the Budget Bureau recognize the urgency of the problem. As they have assisted thus far, we trust that they will continue their good work to a permanent solution of the housing problem of this indispensable government office. Commissioner Robertson will continue to have the support of all industry in his successful effort to advance the Patent Office toward a sound and efficient business basis.

Cents Per

Million B.t.u.

USUALLY the engineer in control of any step in a process of manufacture can easily tell the efficiency of his particular operation. Take, for instance, a by-product coking plant. The yard foreman knows that, from one cause or another, his coal and coke handling equipment handled only 86 per cent of capacity last month. The oven foreman knows the efficiency of his ovens—that the coking time was 18 hours and 5,600 cu.ft. of heating gas was used per ton carbonized. Similarly, the byproduct foreman and the benzol house foreman can tell how operations in their particular fields stack up against bogey.

Reports, charts and other data submitted bring these varying measures of operating efficiency to the attention of the plant manager. As a result he can tell just how well any given department of his plant is operating. But if he were requested to give the commercial efficiency of his plant as a whole, he might be rather put to it to find a common measure that would permit him to collate these varying expressions of performance into an over-all figure.

Just such a measure was recently suggested for the power plant and it can well be applied to any industrial operation where energy of any kind is the principal variable. According to this scheme, devised by Prof. Charles E. Lucke of Columbia University, the commercial efficiency of any process is the ratio of the cost of the input energy to that of the output energy, in cents per million B.t.u. From this concept is developed

an expression that gives this efficiency as the ratio of the energy efficiency E (expressed as a fraction) to one plus the product of E multiplied by the ratio of the sum of the operating and investment costs of the process per unit of output to the unit cost of the input energy. Of course, in the end case, where operating and investment charges are nil, the commercial efficiency becomes the simple ratio of input energy and output energy.

This commercial efficiency obtained in each step of a process, always with the units in cents per million B.t.u., permits the over-all efficiency of the plant to be calculated by simply multiplying the efficiencies of the different steps. The result is a figure by which anyone can tell the results being obtained in any given plant—no matter how unfamiliar he may be with the technology of the process. And this figure is based on a comparison of the really important factor in industrial processes—the energy cost, in cents per million B.t.u.

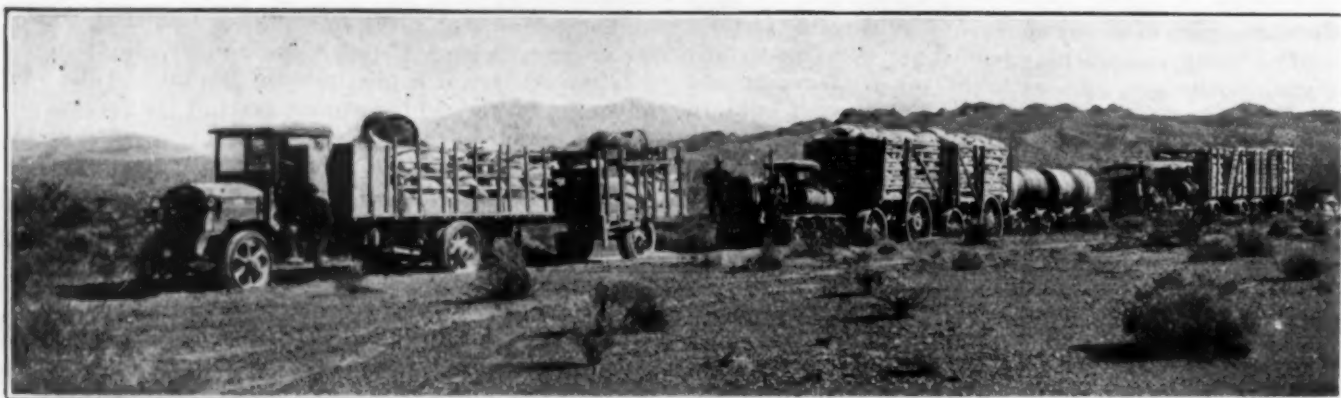
Manufactured Gas and The Industrial Fuel Market

TO THE industrial executive confronted with a choice between heating methods come Greeks bearing slogans instead of gifts. On one side he is beset with representatives of the power companies, who, stating that this is an "electrical age," say, "Do it with electricity." On the other gather the gas interests, crying, "If it's done with heat, it can be done better with gas." While from time to time those interested in promoting the direct industrial use of coal, fuel oil and other heating means press forward with their claims.

In spite of the course taken by the salesmen for these energy sources, there should be no competition among them. Rather, they should be co-workers and co-operators in the chemical engineering industries; for each fuel has its uses, for which it is better fitted than any of the others—uses for which it will permit an economy obtainable in no other way.

It is interesting to note, in the light of these facts, the growing use of gas as an industrial fuel. In a report recently made public, the officials of the American Gas Association estimate that 22 per cent of all manufactured gas is now sold for industrial uses. And this percentage is rapidly increasing with the years, for the present-day increases in gas consumption are almost altogether industrial in nature.

These facts mean that the chemical engineer must give increasing attention to the possibilities of gas for industrial heating. Gas is a handy form of energy and in most industrial districts is readily available at prices regulated by public authorities. Thus the purchaser can be assured that whenever industrial heating can most efficiently be done by gas he need only arrange for proper service connection and he has at hand, 24 hours a day, 365 days a year, this agile assistant for industrial processing. Furthermore, the gas company usually has, or can readily get, dependable technical information regarding the latest methods of steam-raising by small gas-fired boilers, or furnace or oven heating by gas, or of any other of the thousand and one uses which industry makes of this jack-of-all-trades among energy sources. For casual or incidental plant uses, it is never safe to ignore the possibility of gas, for there are surprisingly efficient forms of equipment and methods of use now available in all of these fields.



Hauling Colemanite to the Railroad in Nevada

Borax From Colemanite

From Colemanite, a Calcium Borate, Most of the Borax Used in the United States Is Made by Digesting With Sodium Carbonate and Bicarbonate, Filtering and Allowing the Decahydrate to Crystallize From the Solution

By **Burton G. Wood**

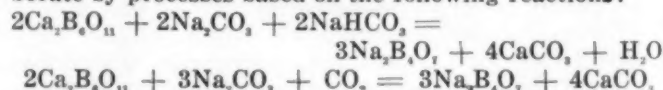
Chemical Engineer, Los Angeles

NEARLY all of the borax produced in the United States at the present time is obtained from the ore colemanite, $\text{Ca}_2\text{B}_6\text{O}_{11} \cdot 5\text{H}_2\text{O}$. Large deposits of this ore are being worked at Death Valley, Calif., and in Clark County, Nevada. There is one large deposit of ulexite ($\text{NaCaB}_4\text{O}_7 \cdot 8\text{H}_2\text{O}$) in California, of such purity that it could be used directly in making enamels, but the owners are not disposed to offer the ore for sale.

Preliminary calcination of the crude colemanite in rotary kilns (Fig. 1) at the mine removes the water of crystallization and forms calcium borate, or borate as it is commonly called. As shipped to the refinery this contains 30 to 42 per cent B_2O_3 , 1 to 10 per cent calcium sulphate, the remainder being clay, sand and calcium car-

bonate. The percentage of calcium sulphate has a direct influence on the cost of refining, as sodium carbonate is used in the process.

Borax is obtained from the calcined colemanite or borate by processes based on the following reactions:



In the first, a mixture of soda ash and sodium bicarbonate is used, generally sesquicarbonate of soda; in the second, sodium carbonate and waste carbon dioxide gas. The latter process is suitable where natural or artificial gas is used as fuel, the products of combustion being drawn from the boiler stack and passed through the boiling solution. As a substitute for sesquicarbonate of

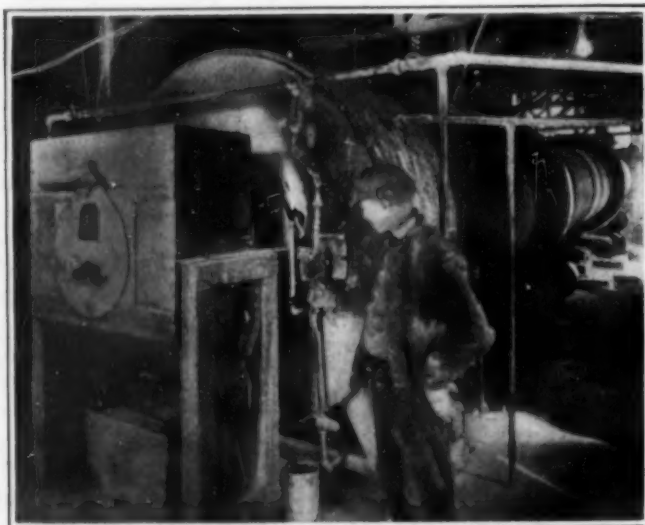


Fig. 1—Rotary Calcining Kiln

Before shipping to the refinery, water of crystallization is removed from the colemanite by calcining.

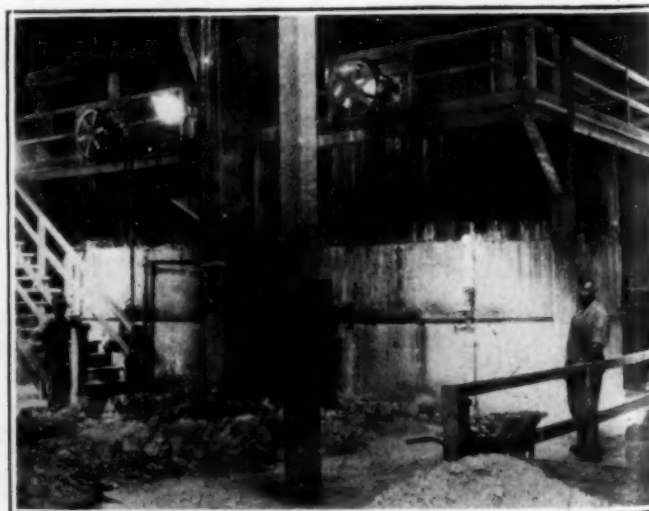


Fig. 2—Digesters

At the refinery, the calcined colemanite, or borate, is digested with trona to form borax.

soda, natural soda or trona is available. In practice excess Na_2O in amount equivalent to about 9 per cent of the weight of B_2O_3 is used.

The process of manufacture involves cooking, stirring and filtering. The reaction tanks or digesters are closed iron vessels, Fig. 2, 21 ft. diameter by 8 ft. deep, covered with 85 per cent magnesia. They are equipped with counter agitators and heated with 2-in. coils sufficient to raise the temperature of the water or mother liquor from cold (20 deg. C.) to boiling point in 2 hours. The trona, 9,100 kg. with 35 per cent Na_2O , is added first and allowed to dissolve in 50 cu.m. of mother liquor containing about 25 grams per liter of sodium carbonate and 50 grams per liter of borax; this amount of trona carries the 9 per cent excess. Trona for making borax should not contain more than 1.5 per cent of sodium sulphate and 2 per cent of sodium chloride;

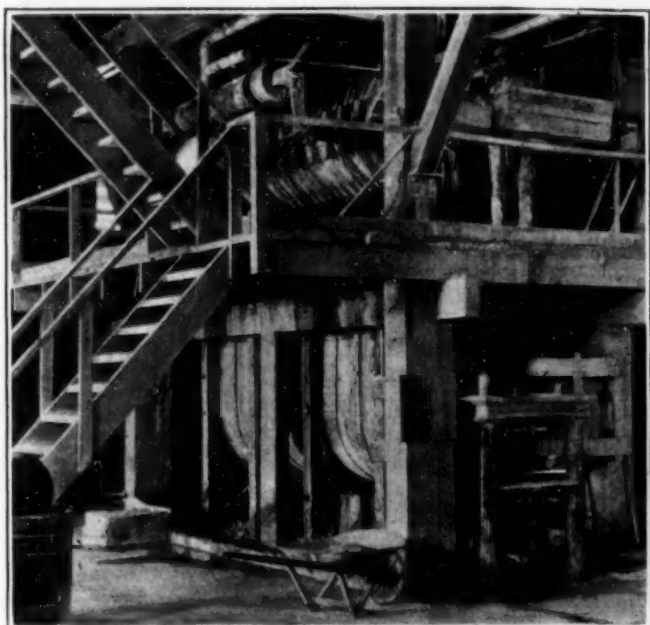


Fig. 3—Filter Press and Mud Box

Borax solution passes through the filter press on platform; the cake is made into a sludge in the mud box below and discharged in this form.

sodium carbonate and sodium bicarbonate are usually present in trona in approximately equal amounts.

In the next step, 13,000 kg. of borate (40 per cent B_2O_3), or the equivalent of 5,200 kg. of B_2O_3 , is added. Borate containing less than 33 per cent B_2O_3 should not be used, otherwise the cost of manufacture is more than the value of the refined borax, the cost of ore being \$1 per unit of B_2O_3 , and borax selling for \$90 per ton. Should the borate used contain calcium sulphate, the requisite amount of trona must be added to combine with it, which is 1.3 lb. of trona (35 per cent Na_2O) per pound of calcium sulphate.

The mixture is boiled for 6 hours and then filtered while hot through a No. 12 Sweetland press, Fig. 3. Filtering requires about 10 hours per digester. The cake is well washed with hot water, the wash water being saved and used to compensate for the water taken up by the finished crystals, which contain 47 per cent. The cake after washing analyzes about 2 per cent borax and 1.5 per cent borate, the remainder being calcium carbonate, sodium sulphate, salt, dirt and 20 per cent moisture. The mud is discharged into an oblong wood tank that fits underneath the filter. In this it is agitated

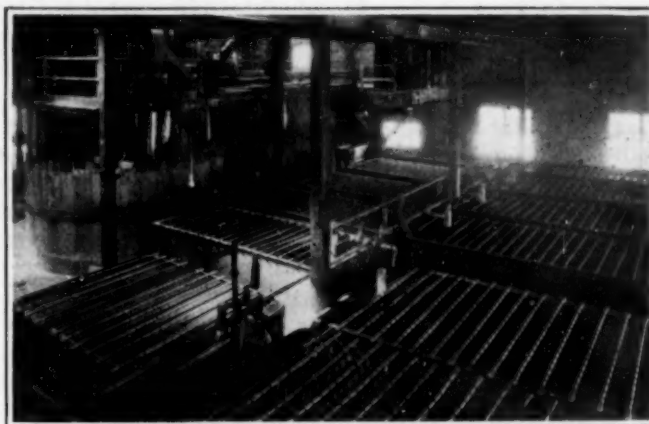


Fig. 4—Crystallizing Tanks

In these iron tanks, the borax solution cools, depositing crystals on the sides and on rods hung from cross bars.

with wash or waste water until all large pieces are broken up, and then run to waste. The filtrate from the Sweetland press passes to iron tanks 4 ft. deep, 8 ft. wide and 16 ft. long, in which are suspended $\frac{1}{4}$ -in. iron rods, spaced about 6 in. apart, being hung from a series of horizontal rods that rest on the edges of the tank (Fig. 4). The adoption of this system greatly accelerates cooling, first by conduction and then by radiation.

As the cooling proceeds, crystals are deposited on the rods (Fig. 5) and side walls. The size of the crystals depends on the concentration of the liquor and the rate of cooling. At a concentration of 324 grams per liter of borax and 20 grams per liter of sodium carbonate, the accretion on the rods becomes about 3 in. diameter. It requires about 7 days for a tank to cool, after which the mother liquor is drained into storage, from which it is drawn to make the next charge. As the cycle is repeated, the salt and sulphate accumulate up to a certain point, after which they remain in the mud and are discharged. If the refining process is properly controlled, the borax will contain only traces of salt and sulphate, even if there is a considerable amount of both in the mother liquor. The crystals are allowed to drain

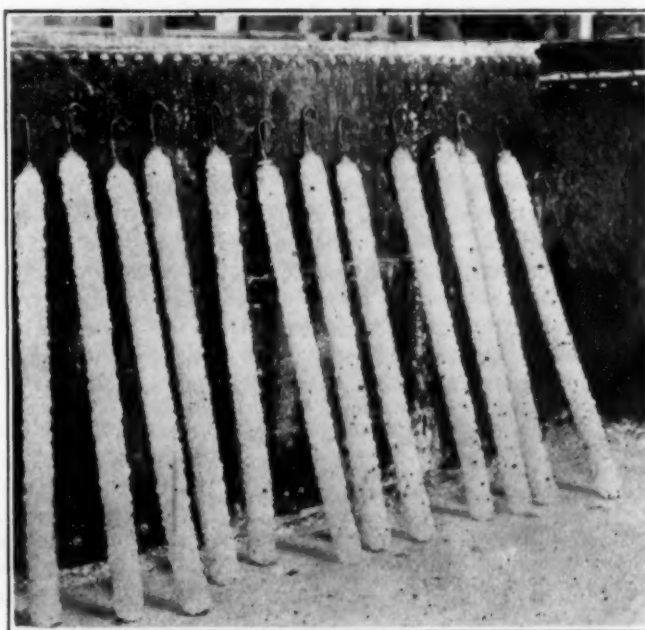


Fig. 5—Borax Crystals

Borax crystals build up on the rods until the mass is about 3 in. in diameter.

in the tanks, and are then shoveled out, and dried by exposure to the air. They should be used as soon as dry, as they begin to lose water of crystallization immediately.

Borax appears on the market as impalpable powder, powder, granulated, $\frac{1}{4}$ -in. crystals, $\frac{1}{8}$ -in. crystals and in lump form. The different grades are prepared from the original crystals by grinding and screening. Most of the product sold contains 102 to 105 per cent borax calculated as decahydrate, $\text{Na}_2\text{B}_4\text{O}_{10}\cdot 10\text{H}_2\text{O}$; 0 to 1 per cent sodium carbonate; 0 to 0.75 per cent sodium sulphate and 0 to 0.5 per cent salt. The high borax content results from an adjustment of crystallization rate, so that an appreciable quantity of the pentahydrate is formed. Borax also crystallizes in flat plates, which look exactly like crystals of boric acid.

Borax glass, another product, is anhydrous borax, made by feeding borax to a type of reverberatory furnace, in which it is heated to about 800 deg. C. The borax first swells up, and finally settles to a colorless liquid, after which it is drawn from the furnace, cooled and ground to minus 30 mesh.

Sodium Cyanide as a Byproduct of Coke Making

Description of a Process That Permits the Recovery of This Material or of Any Other Cyanogen Compound as a Byproduct

By M. E. Mueller

Consulting Chemical Engineer, Syracuse, N. Y.

IN THE carbonization of coal a small percentage of its nitrogen content appears in the gas as hydrocyanic acid. Several processes now in operation for the recovery of this cyanide aim at the production of ferrocyanides. By the process described herewith the cyanogen becomes available for the production of practically any form of cyanogen compound. Through slight modifications in the process, sodium or potassium cyanide, liquid hydrocyanic acid or yellow prussiate of soda or potash can be made. Of these, sodium cyanide is the most important commercially and the description of the process will in the main be confined to the production of this chemical.

The amount of cyanogen formed in the coking process varies somewhat with the nitrogen content of the coal used, with the type of retort or oven and with the operating conditions. In byproduct coke ovens it will be equivalent to about 2 lb. of sodium cyanide per ton of coal carbonized. With gas retorts of the horizontal or inclined type the production is approximately 50 per cent greater. A comparison of the value of the usual byproducts recovered with that of the sodium cyanide recoverable would be somewhat as follows:

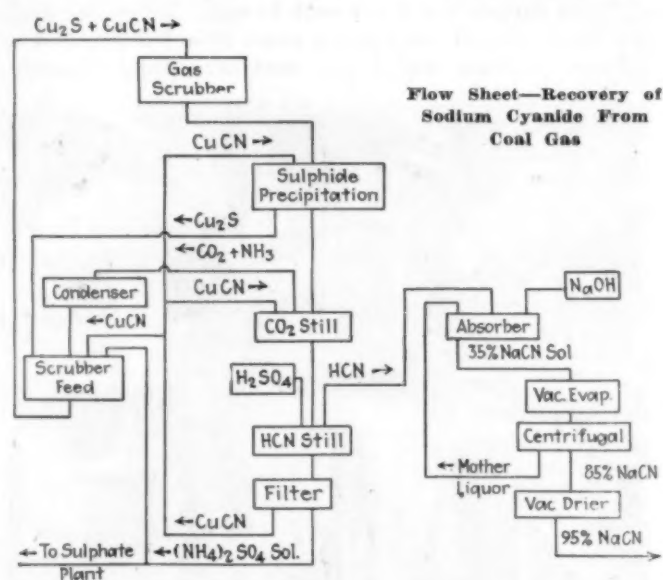
22 lb. sulphate of ammonia at 3c.....	\$0.66
10 gal. tar at 3c.....	.30
3 gal. light oil at 18c.....	.54
2 lb. sodium cyanide at 20c.....	.40

These figures indicate that with an economical method of recovery the importance of cyanide as a byproduct would be about the same as that of the other byproducts.

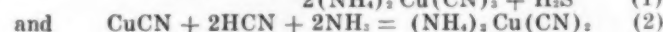
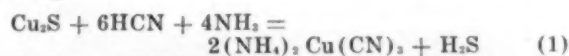
The process of cyanide recovery recently developed by the writer (U. S. Patents Nos. 1,413,762-3) makes use of copper compounds to extract the cyanide from

the gas instead of the iron salts that are usually employed. These copper compounds are regenerated in the process without appreciable loss, and some large-scale tests have shown that they do not diminish in efficiency after repeated use. The form in which copper is originally introduced into the operation is immaterial, since it is returned to the process as copper sulphide and copper cyanide after it has once been through the cycle of operations. To inaugurate the process such comparatively inexpensive forms of copper as copper scale or matte can be used.

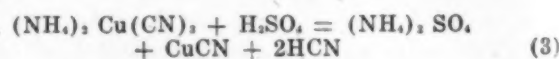
In the operation of this process the gas is scrubbed, before removal of the ammonia, with water carrying in suspension copper sulphide and copper cyanide. In



the presence of ammonia these compounds are very active absorbents of hydrocyanic acid with the formation of double cyanides of copper and ammonia. These double cyanides are soluble, and as the extraction of hydrocyanic acid proceeds the insoluble copper sulphide and cyanide pass into solution. The composition of the double cyanide formed varies somewhat, but generally lies between the limits as expressed by the formulas $(\text{NH}_4)_2\text{Cu}(\text{CN})_2$ and $(\text{NH}_4)_3\text{Cu}(\text{CN})_3$, the reaction being



The double cyanides of copper and ammonia differ from the ordinary copper salts in that the copper is not thrown out of solution by contact with iron or steel nor by hydrogen sulphide. On boiling with dilute sulphuric acid, the copper is completely precipitated as copper cyanide (CuCN) and the ammonia is converted to sulphate. The cyanogen corresponding to the ammonia is liberated as hydrocyanic acid, and may be condensed as such or absorbed in caustic soda to form sodium cyanide. The copper cyanide precipitated is used to extract more cyanide from the gas. The reaction is:



These are the basic reactions of the process. In practice, however, the solution obtained by scrubbing the gas with copper compounds will contain, besides the ammonium cupro-cyanide, other ammonia com-

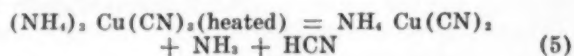
pounds such as sulphide and carbonate and possibly some tar. This makes necessary certain changes in procedure. The tar can readily be removed by allowing it to settle out. This, however, is not necessary until there has been a considerable accumulation, as it has been demonstrated that the presence of tar in the scrubbing medium does not affect the extraction.

The presence of ammonium sulphide in the liquor would not necessitate any modification of the operation as outlined above, providing one very simple condition is observed—namely, that there be present in the solution sufficient copper to combine with the sulphide when the solution is decomposed with sulphuric acid. If this condition is observed, the hydrogen sulphide liberated by the action of the sulphuric acid will react with the copper cyanide to form copper sulphide and liberate more hydrocyanic acid, all sulphide being precipitated as Cu_2S .



There is no difficulty in maintaining a sufficiency of copper for this reaction and the presence of hydrogen sulphide in the gas is actually a help, as it means that a part of the copper is returned to the gas scrubber as copper sulphide. This absorbs three molecules of HCN from the gas per atom of copper, as against two for copper cyanide. In practice the sulphide present in the liquor is removed by precipitating with copper cyanide incidentally to the removal of the carbon dioxide from the liquor, as explained below. In order that there be enough copper cyanide regenerated in the later steps of the operation for this and other requirements, it is necessary that there be sufficient copper in the solution to combine with all the sulphide present.

The carbon dioxide can be removed from the liquor by boiling for a few minutes before adding the sulphuric acid. However, if this is done with the liquor as it comes from the scrubber, there will be a considerable loss of hydrocyanic acid due to the decomposition of the ammonium cupro-cyanide.



This loss of hydrocyanic acid can be prevented by adding an excess of copper cyanide to the liquor before boiling, forming another double cyanide of approximately the composition $\text{NH}_4\text{Cu}(\text{CN})_3$, but which can be boiled without loss of hydrocyanic acid. The first effect of adding copper cyanide to the liquor is to precipitate the sulphide. This settles out rapidly and carries with it any tar present. The sulphide is returned to the gas scrubber, the clear liquor is drawn off, more copper cyanide is added and the liquor is boiled a short time. This drives off the CO_2 together with a little free ammonia, to recover which the vapors are passed through a small condenser and the condensate returned to the scrubber with the copper sulphide.

After expelling the CO_2 the liquor is transferred to a lead-lined still, acidified with sulphuric acid and boiled to drive off hydrocyanic acid. The HCN vapors, free from CO_2 and H_2S , are passed through a dephlegmator to condense most of the water vapor and into caustic soda solution. In this way a very pure 35 to 40 per cent solution of sodium cyanide is obtained. The residue remaining in the still consists of a solution of ammonium sulphate with a precipitate of copper cyanide. These are easily separated by settling or filtering. The copper cyanide will settle out almost completely by run-

ning the liquor through a sludge box and the last traces can be recovered by passing the overflow from the sludge box through a gravity filter. The sulphate solution is transferred to the sulphate plant. By using a part of this solution in place of water for making up fresh batches of scrubbing liquor, the concentration of the sulphate liquor is increased and the volume transferred to the sulphate plant is decreased, so that little extra concentration of this liquor will be necessary.

To recover sodium cyanide from the 35 to 40 per cent solution the solution is evaporated in a vacuum evaporator to a crystal mush and centrifuged. This will give a product testing approximately 85 per cent sodium cyanide and 12 per cent water. On cooling, this water will combine as water of crystallization so that there will be no free moisture present. If an absolutely dry cyanide is required, the centrifuged product is dried in a rotary vacuum drier. This yields a product testing about 95 per cent pure, which compares favorably with the best cyanide produced. In the recovery of sodium cyanide from solutions efficient vacuum apparatus is essential to avoid loss of cyanide due to decomposition. There will always be some loss from this source, but with proper equipment this should not exceed 5 per cent.

The process as outlined above was tested at the by-product coke plant of the Semet-Solvay Co. at Ashland, Ky. In this test one of the five sections of a grid type ammonia scrubber, 8x8x20 ft. high, was used as a cyanide scrubber, and all the gas from approximately 1,000 tons of coal per day passed through this. The quantity of copper compounds available during this experiment was sufficient to take care of the cyanogen

Production Cost for 4,000 Lb. Sodium Cyanide

Operating labor, 16 men, 8 hr.....	\$80.00
Repairs: labor and material.....	35.00
Caustic soda, 3,400 lb. at 3.2c.....	108.80
Copper losses	5.00
Steam, 100,000 lb. at 30c.....	30.00
Electricity	16.00
Water	3.00
Proportion of general plant expense.....	25.00
Interest and depreciation: 25 per cent on \$125,000..	85.00
Total.....	\$387.80
Cost per pound of sodium cyanide.....	.097

production of a few hours only, but during this time the extraction efficiency was very good, sometimes as high as 100 per cent. This demonstrated on a plant scale what had already been indicated by laboratory experiments, that the extraction of cyanides by copper compounds is very active, much more active than with the ferrocyanide methods. During this test the copper was put through the cycle of operations about twenty times without any decrease in efficiency, even though there was a considerable accumulation of tar. About 8,000 lb. of sodium cyanide was recovered in the form of a 35 per cent solution, and of this about 500 lb. was carried through to the dry product. To quote from a report on this experiment, the process was found to be "perfectly feasible, practical and workable."

In this process copper compounds, sulphuric acid and caustic soda are used. For economical operation it is essential that the process be carried on without serious loss of copper. Except for mechanical losses, which with careful operation should be very slight, the only possibility of losing copper is through the solubility of

copper cyanide in the ammonium sulphate liquor in the residue from the HCN still. The loss from this source will be about 1 lb. of copper for every 3,000 lb. of cyanide recovered, which, of course, is negligible. All the sulphuric acid used in this process is converted to ammonium sulphate and effects a corresponding saving of acid in the sulphate operation. The acid used is therefore not a charge against the production of cyanide. Caustic soda used in the process will be 0.85 lb. per pound of sodium cyanide. This represents a charge of about 3 cents per pound of cyanide.

The cost of recovering sodium cyanide will depend to a considerable extent on the scale of operation. The estimate in the accompanying table is on a basis of 4,000 lb. of cyanide per day, equivalent to the output of a plant coking from 2,000 to 2,500 tons of coal.

This estimate is for a dry product testing about 95 per cent pure. In some cases it may be possible to market the cyanide either as a concentrated solution or as a semi-dry product with approximately 12 per cent of water, either of which forms would result in a considerable saving in production cost.

Potassium cyanide, which for some uses is preferable to the sodium salt, can, of course, be made by this method. Liquid hydrocyanic acid, which has become a commercial article, is also readily recovered without first going through the sodium cyanide stage. To make yellow prussiate, the vapors from the HCN still are absorbed in iron sulphate precipitated with an excess of lime. This forms calcium ferrocyanide solution, which is filtered from the calcium sulphate and excess lime and converted to sodium ferrocyanide by addition of soda ash. This procedure works out far better than attempting to produce yellow prussiate by absorbing the HCN in iron sulphate precipitated with an excess of soda ash.

Mercury Poisoning Facts Presented

As a result of a study of the effect of small quantities of mercurial vapor on workers in laboratories or industrial plants, Dr. J. A. Turner, of the United States Public Health Service, has arrived at the following conclusions:

1. Daily exposure to an atmosphere containing as small a quantity as 0.02 mg. of mercury per cubic foot of air results in signs and symptoms of poisoning. The histories indicate that daily exposure must continue for 2 to 3 months, or more, before symptoms begin to appear.

2. It is estimated that in exposure to the above quantities of mercury for 3 to 5 hours daily there is a total daily absorption of mercury ranging from 0.771 to 1.285 mg., according to the duration of exposure.

3. Mercury is volatilized from both the 10 and 20 kw. induction furnaces during their operation. This mercury vapor is disseminated throughout the room and recondensed to the metallic form. This is evidenced by analysis of dust samples obtained at various distances from the furnaces, which showed the presence of from 1 to 3 per cent of mercury.

4. The objective symptoms of chronic mercurialism are manifested by a copper-colored discoloration of the mucous membrane of the pharynx, the pillars of the fauces, and the gums. This discoloration was constant in all cases and should not be confused with infective inflammatory processes, which it somewhat resembles. The gums are swollen, and there is enlargement of the

capillaries. Superficial erosions appear upon the mucous membrane of the gums, and upon the buccal mucous membrane in the vicinity of the upper molar teeth. Periapical abscesses frequently occur and cause considerable discomfort. Occasionally there is an appreciable increase in the flow of saliva. Urine analysis and differential blood counts show the urine and the blood to be unaffected by the mercury absorbed. Subjective symptoms are characterized by tenderness of the gums and hypersensitiveness of the teeth, particularly those containing amalgam fillings. Activity of intestinal peristalsis is slightly increased, occasionally developing into mild attacks of diarrhea. Obstinate constipation is developed during absence from the laboratory for 1 to 2 weeks. Gastro-intestinal disturbance is manifested by pain due to accumulation of gas; there is often distention and feeling of weight in the hypogastric and iliac regions. As mentioned, there are occasional attacks of diarrhea. Shifting neuralgic pains are occasionally felt in the various joints and in the chest.

5. The problem of the prevention of mercurial poisoning in laboratories and industrial establishments can best be solved by inclosing all apparatus in which mercury is used and by conveying the fumes away from the worker's face so that it will be impossible for him to inhale them.

The complete report covering this investigation has been reprinted from Public Health Reports as No. 903 and may be obtained from the Government Printing Office, Washington, D. C.

Fractional Eduction of Oil From Oil Shale

Tests conducted by the Department of the Interior at the Boulder, Colo., field office of the Bureau of Mines tend to disprove the theory of the fractional eduction of oil from oil shale. This theory, state Martin J. Gavin and Lewis C. Karrick in Serial 2588, just issued by the Bureau of Mines, has been used by several inventors as the basis for the design of retorts for the production of oil from the oil shales of the United States. The term fractional "eduction" gives expression to the rather common belief that when an oil shale is heated it produces light, low-boiling oils at low temperatures, and increasingly heavier, higher-boiling oils as the temperature of retorting rises. The theory evidently had its origin in the fact that crude petroleum may be fractionally distilled, yielding light oils at low distillation temperatures, and heavier oils as the distillation temperature increases. Thus gasoline is produced from petroleum at relatively low temperatures, kerosene at a higher temperature and heavier products such as gas oil and lubricating distillates at still higher temperatures.

The Bureau of Mines has examined several oil-shale retorts designed to take advantage of the belief that crude, and in some cases refined, gasoline can be recovered from the shale at low temperatures, kerosene at higher temperatures, and so on. Such retorts are usually designed to operate continuously and have several vapor pipes leading from them at differing intervals and passing to separate condensers. Designers of such retorts expect that the distillate from the low-temperature parts of the retort will be gasoline, and that as the shale passes to zones of increasingly higher temperatures, the vapor lines leading from these zones will remove increasingly heavier products such as kerosene, gas oil, etc.

Controlling Factors in Metallic Resistor Furnaces

In This, the Second of Two Articles, a Discussion Is Given of the Laws,
Chemical, Physical and Economic, Governing the Use of This Equipment

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THE first of these articles was more or less confined to a statement of facts, without pointing out the means used, and physical and chemical laws observed and employed to advance designs to their present stage.

In order further to emphasize the fact that efficient furnace design embodies the highest practical, scientific and engineering skill, it is well to point out, in general, some of the information a successful designer of the furnace types discussed in this paper must have. This may be listed as follows:

I—Chemical Laws:

1. Chemical reactions at low and high temperatures.
2. Oxidation, decarbonization at high temperatures.
3. Fluxing of refractories—effect of furnace atmospheres.

II—Mechanical Laws:

1. Expansion and contraction with heat.
2. Physical strength at low and high temperatures.
3. Crystal growth—with temperature.
4. Abrasion of refractories when hot.
5. Mechanical methods of construction.

III—Physical Laws:

1. Heat generation.
2. Heat conservation.
3. Heat transmission.
4. Heat absorption.
5. Heat distribution.
6. Heat storage.
7. Heat equalization.
8. Heat emissivity.
9. Heat potential.
10. Heat diffusion.
11. Heat quantity.
12. Temperature gradients.
13. Control of temperatures through control of heat flow.

IV—Laws of Environment and Psychology:

1. Complete knowledge of the heating process involved, and
2. More or less complete knowledge of shop methods and individuals who will use the furnace.
3. Peculiarities associated with product or methods of manufacture.
4. Frame of mind of operators—will he support or antagonize a given design?
5. Do executives realize importance of proper furnace designs, and how far will they modify methods to take fullest advantage of new and progressive equipment offered?
6. Does equipment give better working conditions for the operator?

V—Economic Laws:

1. Covering first cost of furnace.
2. Covering operation and operating cost of furnace.
3. Covering reduction of cost of producing and retaining the same quality.
4. Covering increase and uniformity of quality, and yet retaining the same cost of production.
5. Greater output for same floor space.
6. Greater reduction in labor.
7. Greater use of equipment in the line of production, etc.

It is purposed to discuss briefly only a few of the most important and perhaps interesting laws grouped in the foregoing outline, such as (A) heat generation, (B) heat conservation or thermal efficiency, (C) heat emissivity and rate of heating, (D) heat distribution and equalization, (E) heat transmission and temperature gradients, (F) control of temperature through heat flow.

These general groups are chosen because through them it is hoped an exposition can be made that clearly differentiates between the muffled and "restricted" resistance furnace and the unmuffled and unfettered furnace, when applied to general industrial heating problems.

The discussions to follow will be limited to the laws as they apply in the design of the electric metallic resistor furnace.

A. Heat Generation—Little need be said concerning heat generation in the electric resistance furnace save that the efficiency of heat generation from the electric power is 100 per cent perfect. This is always so whether the operator so wills it or not, and each kilowatt-hour fed to the resistor generates under all conditions 3,412 B.t.u. Hence, independent of design or operation, this generation of heat is 100 per cent perfect in the metallic resistor furnace.

B. Heat Conservation or Thermal Efficiency—Heat having been generated within the furnace, its conservation is more or less perfect, depending (1) upon the construction of its walls, roof, floor and doors, and (2) the ventilation of its heating or working chamber. The degree to which the outer wall resists heat leakage through it is a measure of the heat loss through the wall, and this loss acts to make 100 per cent conservation of heat impossible, since as yet no perfect

HEAT TRANSFER

In the first of these two articles the author described the various types of resistance furnaces used and gave illustrations of their industrial application. In the present article the influence of the conditions surrounding the application on the utility of the metallic resistor type of furnace are discussed. This discussion will be particularly useful to industries contemplating the use of electric heating in their processes. And the conclusion presents an especially strong argument for the use of this means of heating.

A UNIT PROCESS OF CHEMICAL ENGINEERING

heat-insulating substance is known. However, such substances as kieselguhr or magnesia may be employed commercially to give wall losses consistent with high thermal efficiency. If a flow of hot gas is allowed from the furnace chamber for the sake of ventilation required for the heated material, or if it be due to poor mechanical construction, such as poor door fits, etc., then this heat loss is added to the wall loss and contributes in a greater or less degree to a lowering of the thermal efficiency.

C. Heat Emissivity and Rate of Heating—Experiment shows that, if the emissivity from resistor surface must be 10 watts per sq.in., then its temperature above a furnace chamber at 1,400 deg. F. is 120 deg. F., and above a chamber temperature of 1,500 deg. F. it is 90 deg. F. Again, if the emissivity is at the rate of 30 watts per sq.in., then the resistor temperature gradients are 230 deg. F. and 210 deg. F. respectively. Hence, for a given power input to the resistor, we must provide sufficient square inches of resistor surface to give off its equivalent in heat units to a required heating chamber temperature without calling for an emissivity rate that will drive the metallic resistor to an excessive temperature. In other words, the lower the rate of emissivity from resistor at the working temperature of the heating chamber the more conservative the design and hence the greater the factor of safety. Economy

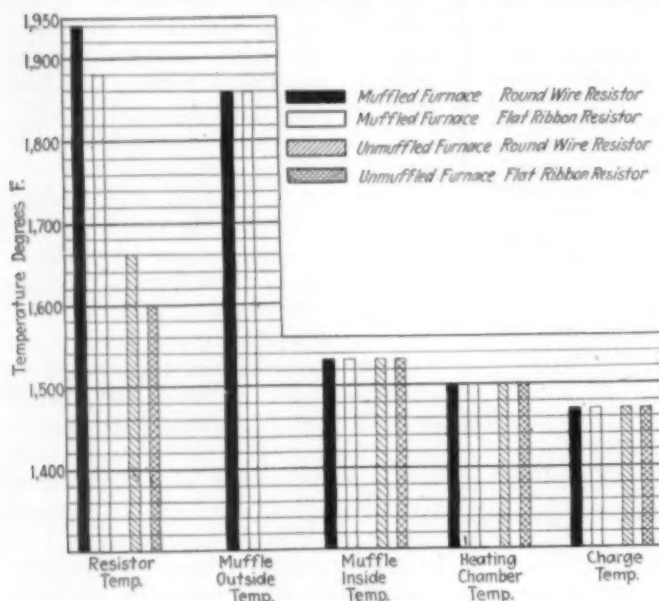


Fig. 1—Comparison of Round and Ribbon Resistors in Muffled and Unmuffled Furnaces

consistent with reasonable cost of resistor must at the same time be observed.

To illustrate this let us take a round wire resistor, 0.190 in. diameter (approximately) and 30,000 sq.mils cross-section and 7.2 sq.in. of surface per foot length of resistor. Assuming 40 watts is radiated per sq.in. of resistor to a 1,500 deg. F. heating chamber, then it can be shown that the resistor temperature will be about 1,760 deg. F. Now consider what the resistor temperature will be if a ribbon $750 \times 40 = 30,000$ sq.mils will be giving the same heat per foot length of resistor to the furnace chamber. Here we have 18 sq.in. (approx.) per foot length of resistor, radiating surface to give 7.2×40 watts per 288.0 watts per foot just as in the case of the round wire conductor which has the same metal cross-section, or a density per square inch

of surface of ribbon equal to $288 \div 18 = 17.7$ watts per sq.in.

Tests show that this ribbon resistor will operate at 1,640 deg. F. in a furnace chamber of 1,500 deg. F. By putting our resistor metal in different form, we gain, with the same emissivity per foot length of resistor, a drop in resistor temperature from 1,760 deg. F. for the round wire to 1,650 deg. F. for the ribbon (see Fig. 1). This clearly indicates that for the sake of economy and safety the ribbon resistor is superior to the round wire, even though resistors of proper chrome-nickel alloys will not oxidize at the temperatures required.

D. Heat Distribution and Equalization—We now come to this important subject, concerning which many are vaguely informed.

Heat may get away from the resistor in a furnace by three ways—viz., convection, conduction and radiation. Suffice it to say that in furnaces operating at high temperatures and with which this paper deals, the influence of convected heat may be neglected. This, then, leaves but two methods for heat transfer to be considered here.

In the case of the muffled resistor heat is generated, first, in the resistor outside the muffle; second, radiated to the furnace wall and also to the muffle of fireclay or alundum, as the case may be; third, conducted through the muffle wall to the heating chamber; and finally, fourth, radiated from the muffle to the charge which absorbs it.

When an unmuffled resistor is used, heat is generated, first, in the resistor on walls, second, heat is radiated to the furnace walls, which become heated, and which finally reflect and radiate back to the charge and walls all the heat that does not penetrate the walls to the outside of the furnace. Heat is also radiated directly from resistor to charge and to floor and roof of furnace, which in turn become heated and radiate and reflect heat to the charge. Hence we see that there is a complex radiation direct from resistors and indirect and reflected heat from the whole interior surface to the charge to be heated. Radiant heat, like light, radiates and reflects from all points of high potential or temperature to points of lower potential or temperature with practically no resistance. Just as water seeks its level, so does radiant heat seek a uniform temperature or heat potential. If, therefore, heat is liberated by radiation in a closed chamber, that chamber is, thanks to reflection and re-radiation, maintained at a uniform temperature regardless of the source of heat or its location, if the chamber allows unimpeded radiation. Any body interposed between a radiant source impedes the transfer of heat by radiation to the cold body. Hence designs should be such as to allow of free radiation from resistor and furnace walls.

"Radiation of heat takes place between bodies at all distances apart and follows the laws for the radiation of light," says an authority. The heat rays proceed in straight lines, and the intensity of the rays radiated from any one source varies inversely as the square of their distance from the source.

This statement has been erroneously interpreted by some writers, who have assumed from it that a boiler placed 2 ft. above a fire would receive by radiation only one-fourth as much heat as if it were only 1 ft. above. The law refers only to the emanation of heat rays in all directions in radial lines from a single point. When the radiation is from a multitude of points as from a

surface, the rays from the several points cross one another and cause the intensity at moderate distances to be much greater than the law of inverse squares would indicate. Moreover, the walls of furnaces reflect the rays that are received at an angle, with the result that the intensity of heat 2 ft. above the fire is practically the same as at 1 ft. above. (See test on Fig. 2).

This, then, conforms with preceding statements, and shows the reasoning to be sound.

Much more could be offered to support the truth of what has been said relative to radiation of heat and the falsity of the assumption that uniform heat may not be had in a chamber with the heat source located in groups. Placing heat on all walls, including the floor, does not guarantee uniform heat under all conditions.

For example, suppose the charge to rest directly on a heated floor. Here five sides of the charge receive heat by radiation, and the bottom receives heat by conduction.

The author knows of no simple, practical means of insuring that the temperature of the surface receiving heat by conduction is the same as those surfaces that

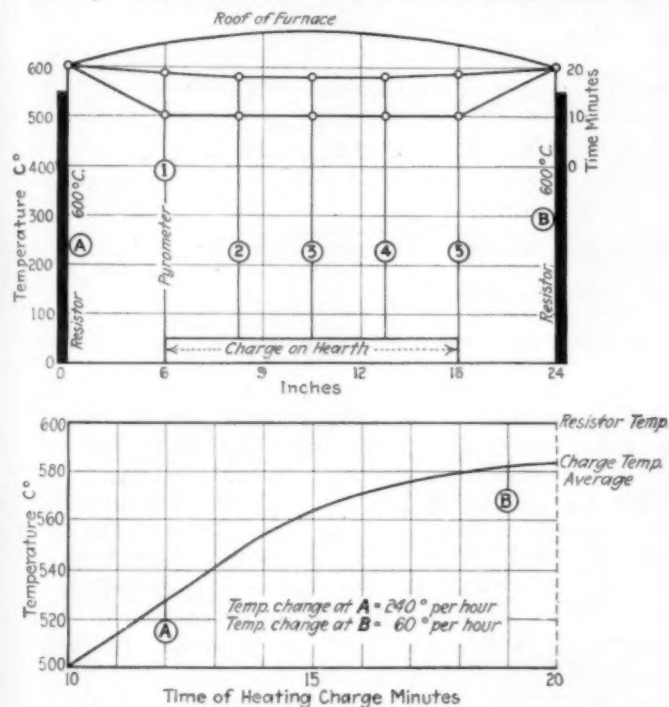


Fig. 2—Heat Distribution in Furnace

Heat distribution curves with sources of heat concentrated on opposite furnace walls, showing uniformity across hearth of unmuffled metallic ribbon resistors and showing relation of time to temperature of charge.

receive it by radiation. In fact it is more probable that such temperatures are different than that they are the same, especially when the charge in part is near or has reached its maximum desired temperature.

E. Heat Transmission and Temperature Gradients—Ohm's law holds for the flow of heat through heat-conducting bodies just as it does for the flow of current through electrical conductors.

Thus if a conductor of heat has a thermal resistance R (in thermal ohms) and a difference of temperature t (in Centigrade degrees) between its two ends or faces, then the flow of heat H , in watts, is given by the equation.

$$(1) H = t^\circ \div R$$

For illustration, suppose it is desired to know how

much difference in temperature must exist between the two surfaces of the muffle in order to cause a flow of 15 watts per sq.in. through the muffle. We shall assume the muffle $\frac{1}{2}$ in. thick first of fireclay, and second of alundum.

The thermal resistivity of fireclay is about 30 thermal ohms per inch cube, and alundum is about 24 ohms per inch cube.

Assume the working chamber of a furnace to be 800 deg. C. (T_1). Then if heat flow through muffle be 15 watts, the equation becomes $\frac{15 = T_2 + 800^\circ \text{C.}}{15}$ for $\frac{1}{2}$ -in. fireclay muffle, or $T_2 = 800.0 + 225^\circ \text{C.} = 1,025^\circ \text{C.}$

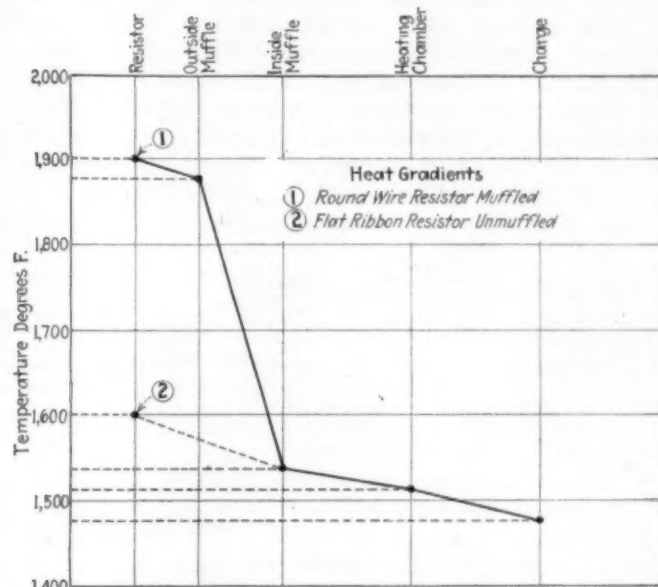


Fig. 3—Comparison of Heat Gradients for Round Wire Resistor Muffled and Ribbon Resistor Unmuffled

Hence the temperature of an electric resistor lying behind a $\frac{1}{2}$ -in. thick fireclay muffle must operate at a temperature of at least 1,025 deg. C. in order to give a heating chamber temperature of 800 deg. C. and a heat flow through muffle of 15 watts per sq.in., which is a value commonly employed in muffled furnaces.

Likewise for an alundum muffle under similar conditions, we find a resistor temperature of 980 deg. C.

If muffles of greater thicknesses are used, then the difference in temperature is proportional to the increase of muffle thickness.

The effect of a $\frac{1}{2}$ -in. muffle is shown in Fig. 3. It can be shown that the round wire resistor must have a temperature of 1,900 deg. F., to feed a furnace 1,475 deg. F.

Assume now that the resistor and charge to be heated occupy the same chamber. The resistor temperature when sending to the charge a heat flow corresponding to 15 watts per sq.in. of wall as above may be found. So far as radiating heat to the charge is concerned the walls of the heating chamber here become radiating surfaces to the charge, just as the muffle did in the first case. There exists only this difference, that a part of the radiating surface in the unmuffled furnace is located behind the electric resistor and not wholly in front of it, as in the muffled furnace. Therefore the advantage of a large and uniform radiating surface is retained, and the disadvantage of a muffle resisting heat flow to the work is removed. In addition to a radiation from walls to charge, there is direct radiation

from resistor surface to the charge, as already explained.

Hence the surface total radiating to the charge is the sum of radiating surface afforded by the resistor and the total wall surface of the heating chamber, including top, bottom, sides and ends. Thus, if the muffled furnace had an inner muffle area of 100 sq.ft., then the equivalent unmuffled furnace would have 100 sq.ft. of wall and perhaps 50 sq.ft. of ribbon resistor surface, and its total effective radiating surface would be 150 sq.ft.; hence it results that the muffled wire resistor operates at 1,900 deg. F. with a heating chamber of 1,475 deg., while the unmuffled ribbon resistor operates at only 1,600 deg. F., although it gives out the same quantity of heat to the charge.

G. Control of Temperature Through Heat Flow—It has been already shown how thermal resistance plays the same rôle in the flow of heat that electric resistance does in the flow of electricity, and that Ohm's law holds for both. This is with a steady continuous flow of heat or direct current. In the fluctuating flow of heat, ther-

temperature of wire resistor is 880 deg. C., and temperature desired on charge 670 deg. C., and one unit of time is equal to the time required by heat to travel through a $\frac{1}{4}$ -in. alundum muffle, or 6 minutes.

It is seen that the temperature fluctuation when automatic controller is set to trip off the power at 780 deg. C. and trip on the power at 755 deg. C. is 35 deg. C. (approx.), or the control is 780 deg. C. plus 5 deg. C. and 780 deg. C. minus 30 deg. C. This then shows an "overshooting" of temperature of about 5 deg. C. and the same "undershooting."

By referring to curve 2, Fig. 4, it will be seen that the temperature for ribbon resistor unmuffled and the temperature of charge has been plotted for a furnace doing the same work, at the same efficiency and temperature as in curve 1. The same unit of time has been used, and vertical ordinates through all curves represent contemporaneous conditions in each furnace. Here the maximum temperature of resistor is about 1,680 deg. F., and it is desired to bring the charge to a temperature of 1,500 deg. F., and automatic controller is set to trip

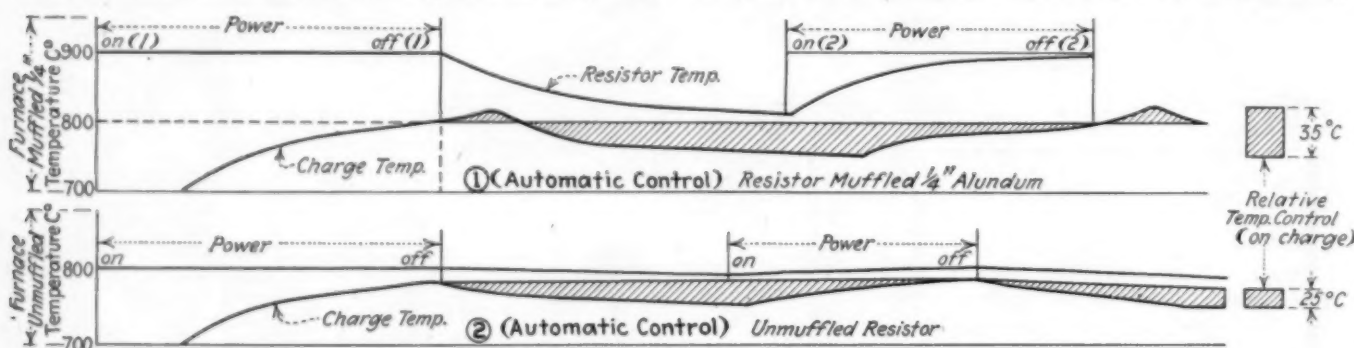


Fig. 4—Comparison of Automatic Control for Muffled and Unmuffled Resistors

mal resistance may not be the only factor affecting the flow of heat into or through a body; such factor does exist and is commonly referred to as the "heat ballast" in a furnace.

In any case the "heat ballast" is constructed of materials having a certain specific heat, by virtue of which it holds a varying heat quantity at different heat potentials. If T° represents the quantity of heat which a body possesses at any temperature, then $T^\circ = W \times T^\circ \times HS$, where W = weight and HS the specific heat.

Where such a body is subject to fluctuating temperatures or heat flow, it acts as a temperature stabilizer, for when the temperature impressed upon the body is falling, a heat flow is given out from the body, and when the temperature is rising, heat is absorbed by the same body; whence the "ballast," "flywheel" or "storage" effect, whichever it may be called. Proper furnace design provides for proper heat "ballast" to contribute sufficiently to temperature stability and yet permit of heating up furnace from cold to working temperatures in a reasonable period. Heat stability, however, as a general rule should not be sacrificed in order to shorten the time of heating up.

It is desired to call attention to the handicap which the muffle of the furnace imposes upon a temperature control, and tends to give hunting or "overshooting" of temperatures.

Curve 1 in Fig. 4 has been plotted using temperature as ordinates and as abscissas time, having as a unit the length of time that is required for heat to travel through muffle from outside to inside. The power supply is also plotted against time. Here the maximum

off power at 1,500 deg. F., and trip on at 1,470 deg. F., just as in curve 1. We now observe that in curve 2 we get a variation in temperature on charge of 25 deg. F. and temperatures fluctuate from 1,500 deg. F. to 1,500 deg. minus 25 deg. F., with no "overshooting" of temperature above 1,500 deg. F. Hence if the same skill be used in designs with muffle and without muffle, that furnace which is unmuffled is more sensitive to temperature control of the charge being heated. The greater the thickness of muffle or the greater its resistance to flow of heat the greater will be the temperature "overshoot" on charge and the more sluggish the control.

The discussion of some of the more important laws of metallic resistor designs has already given a paper of greater length than was intended. It is hoped that what has been said will serve to illustrate the fact that proper design and application of heating equipment for industrial purposes requires engineering of the highest order.

Some who have made a superficial study of electric heating problems do not appreciate this. Many do not understand that a furnace must be designed for its particular duty with as much care and in such variety as are machine tools, for instance. Many times in the past it has been assumed that a furnace is simply a pile of bricks with a sufficient source of heat within it.

Heat energy application in this country has been largely the composite result of promotion and advertisement rather than of engineering. We have had fuel-oil advocates, gas-burning experts, powdered-coal enthusiasts, fuel-oil specialists, etc., but until recently have

lacked the competent furnace engineer familiar with all types of furnaces, who could sit as court of appeal and give unbiased decisions regarding the true economic value of various heat sources for a specific work. To operate with gas a process that might much more advantageously be carried out with other forms of energy is not economy, yet many such cases exist today. Fig. 5 shows the relative costs of four common sources of heat—viz., coal, gas, fuel oil and electricity—in terms of dollars per 100,000 B.t.u. utilized in baking ovens and furnaces. This chart in itself is evidence of the fact that considerations other than B.t.u. cost determine the true efficiency of the thermal processes. For were this not true, how could the electric furnace exist, and how could it show the greater over-all economy that it does in many processes today? Neither could the other two fuels compete with bituminous coal, did not the application of fuel oil or gas carry with it inherent advantages that completely outweighed the difference in cost of the B.t.u. supply. This is the true reason for the use of oil and gas rather than bituminous coal for many thermal processes. For the same reason electric heat is recognized today by competent engineers as the "last word" in carrying through many thermal

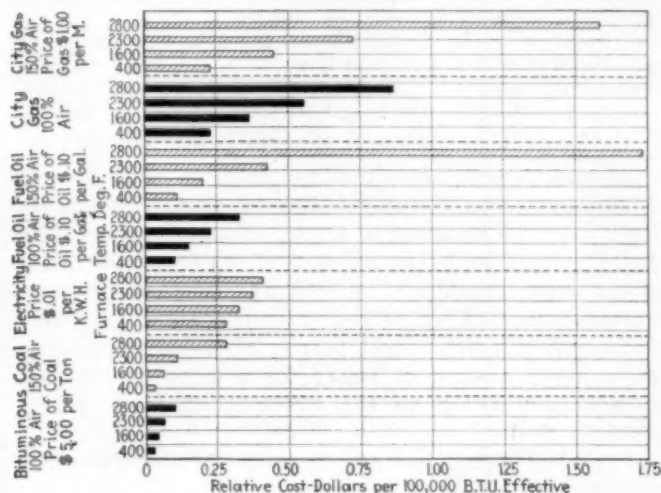


Fig. 5—Relative Thermal Costs for Various Heating Means

processes with maximum safety, uniformity and economy.

Fig. 5 also illustrates well a valuable characteristic of electric heat. It will be noted that the cost of burning fuels varies widely, depending upon the amount of air admitted to furnace and the resultant combustion—for example, the cost of city gas for 100,000 B.t.u. effective rises to double its value with an increase of 50 per cent in air, and such excess percentage of air is by no means rare. Fuel oil likewise increases its cost roughly four times at the same temperature (2,800 deg. F.) and the same excess of air (50 per cent). Thus it is seen to how great an extent the economic operation of the fuel furnace is in the hands of the operator. This handicap does not exist with the electric furnace, where no ratio of combustibles exists to affect the efficiency of conservation.

It is predicted, in conclusion, that it is a matter of no distant time when the use of electric heat for important thermal processes will be adopted with no more hesitation than now occurs when the householder decides in favor of the electric light instead of the gas lamp for his home, even though the cost of current consumed be greater than the cost of combustibles.

Economic Conditions Determine Fuel Research

Haslam & Thiele, reviewing recent progress in fuels, point out the importance of economic and distinct national problems in determining trend of fuel studies. Their summary of the work, both published and unpublished, leads them to the following conclusions:

"If we compare the trend of progress in the principal countries of the world, it appears that the problems selected for attack have been determined by the national necessities of each country. In the United States, faced by high labor costs and competition from Europe, but with excellent fuel, attention has been directed toward cheap and abundant power and the use of fuels in a form requiring little attention. Therefore in this country we are interested in the interlocking of a number of large central power stations into one great superpower system and in the attainment of high boiler efficiencies by the use of powdered coal.

"England has a bad smoke problem caused partly by the use of soft coal in open domestic grates, and in addition, national safety demands large home supplies of bunker oil for the navy. Low-temperature carbonization, giving a smokeless semi-coke together with a large yield of tar oils, promises to solve both these problems at once; hence the great interest in England in low-temperature carbonization.

"On the other hand, the safety of France lies in adequate land defense, so the demand is for a motor fuel for automobiles and aviation engines from sources other than petroleum. The great tropical possessions of France naturally suggest vegetable sources for this fuel; and accordingly we find several different attacks now in progress along this line.

"Germany is also short of oil, but due to her loss of fields of high-grade coal her shortage of coal is more vital; hence we find going on in Germany at the present time important studies in the use of low-grade fuels and in the more rational chemical utilization use of fuels of all sorts."

Use of Nitrogen for Filling Tires Shows Some Promise

Important research work on automobile tires, which has recently been carried out in Great Britain, has led investigators to the conclusion that, apart from ordinary wear and tear, the deterioration of tires is to a considerable extent caused by oxidation. This theory has been substantially supported by the fact that when filled with pure oxygen, tires have been found to undergo a very rapid deterioration.

In consequence, experiments have been carried out with gases of an oxygen-free or inert nature, as a result of which it has been proved that tires filled with such gases have a surprisingly long life. For example, tires inflated with nitrogen and driven for several thousand miles over open roads were found to retain their hardness for more than a year. The loss of the filler gas was extremely small and the condition of the rubber interior was vastly superior to that of ordinary air-inflated tires.

Naturally the question of cost would militate against the use of pure nitrogen for tire-filling purposes, but if the results of these experimental runs were to be borne out in actual practice, such extra cost might be well worth while.

Bentonite Helps Solve Problem in Grinding Asphalt

By H. S. Spence

Mining Engineer, Department of Mines Branch, Ottawa, Canada

THE Mines Branch of the Department of Mines of Canada was recently approached by a firm anxious to develop an asphaltic waterproofing compound for use in paper board. For this purpose, the lump asphalt had to be ground to a powder, and the difficulty was that, during grinding, the fine asphalt particles became tacky and at once started to adhere to one another instead of forming a loose powder. Various substances, including ordinary clay, kaolin, talc, etc., had been ground up with the asphalt without overcoming the difficulty, and the Mines Branch was asked for an opinion as to the possibility of using bentonite, a colloidal clay occurring extensively in western Canada.

The fact that bentonite assists materially in forming water suspensions of enamels and other substances and that asphalt-bentonite emulsions can be made suggested that bentonite might well be used to form a stable and homogeneous bentonite-asphalt mixture for the purpose in view. Consequently the Ore Dressing Division of the Mines Branch undertook a series of tests in the grinding of asphalt-bentonite-water mixtures, as well as of asphalt with bentonite in the dry state and of asphalt with china clay. These tests showed that bentonite can be used very satisfactorily, forming an exceedingly smooth, stable paste, suitable for incorporating into felt, paper or other materials.

GRINDING ASPHALT-BENTONITE-WATER MIXTURES

Test No. 1. *Mixture*: 80 per cent petroleum asphalt and 20 per cent bentonite. Ground in 12x12-in. ball mill for 2½ hours with twice the weight of water. Charge consisted of 4 lb. asphalt, 1 lb. bentonite, 10 lb. water.

Result: A fine, homogeneous, gelatinous mass, which when washed on a 200-mesh screen gave 20 per cent coarser than 200 mesh.

Test No. 2. *Mixture*: 85 per cent petroleum asphalt and 15 per cent bentonite. Ground in 12x12-in. ball mill for 2½ hours with 1½ times the weight of water. Charge consisted of 4.25 lb. asphalt, 0.75 lb. bentonite, 7.5 lb. water.

Result: Product not so fine or gelatinous as in test No. 1; when washed on 200-mesh screen, gave 37.5 per cent coarser than 200 mesh.

Test No. 3. *Mixture*: 90 per cent petroleum asphalt and 10 per cent bentonite. Ground in 12x12-in. ball mill for 2½ hours with an equal weight of water. Charge consisted of 4.5 lb. asphalt, 0.5 lb. bentonite, 5.0 lb. water.

Result: Product coarser and less gelatinous than in test No. 2; when washed on 200-mesh screen, gave 52.5 per cent coarser than 200 mesh.

For the above tests, the asphalt was first crushed to ½ in. and the bentonite was ground to 100 mesh. Bentonite from two sources was used separately, for comparison, one lot being from Rosedale, Alta., and the other from Medicine Bow, Wyo. The latter was supplied by the Owyhee Chemical Products Co., Chicago, being the product marketed as "Wilkinite." No material difference was perceptible in the products made from the two bentonites used.

Test No. 4. Comparative wet-grinding tests were also conducted on asphalt-bentonite and asphalt-china clay mixtures.

Mixture A: 80 per cent asphalt, 20 per cent bentonite and twice the amount of water, by weight.

Mixture B: 80 per cent asphalt, 20 per cent china clay and an equal amount of water, by weight.

Ground in a 12x12-in. ball mill for 2½ hours. Samples were taken at the end of ½, 1, 1½, 2 and 2½ hours.

Examination of the samples, after standing for some time, showed that the bentonite mixture was in each case much finer, more homogeneous, and a superior product in every way to the china clay mixture. The bentonite mixture after 2½ hours grinding was an extremely fine product, whereas the china clay mixture was much coarser, not so homogeneous, and the china clay settled out to some extent on standing.

Test No. 5. Dry grinding tests on asphalt-bentonite mixtures were made in two different types of grinding machines. In the 12x12-in. ball mill, the asphalt softened almost immediately and balled up, forming a sticky mass, and practically no grinding took place. In a laboratory type of Raymond pulverizer, careful adjustment of feed and discharge resulted in a fairly fine product, but this was not nearly as fine or uniform as that made by wet grinding. The higher temperature generated in the ball mill probably accounted in large measure for the gumming of the asphalt.

Test No. 6. A wet grinding test was also made on a mixture of rosin and bentonite.

Mixture: 80 per cent rosin, 20 per cent bentonite and twice the amount of water, by weight.

Ground in a 12x12-in. ball mill for ½ hour. The resultant product was a fine, homogeneous paste, from which no water separated on standing.

RESULTS OF TESTS

The above tests show that the addition of 20 per cent of bentonite in the wet grinding of asphalt assists materially in the securing of a fine, uniform product. The paste formed with the amount of water added in test No. 1 was exceedingly smooth and homogeneous, and no separation of water took place on standing. More prolonged grinding might permit of the addition of an even larger amount of water for a paste of the same consistency, owing to the effecting of more perfect emulsification.

Probably even better results than the above would be obtained by heating the mixture during grinding to a temperature above that of the melting point of the asphalt (160 deg. C.). In this case there would, of course, be no actual grinding of the asphalt, but a homogeneous emulsion might be expected to result, which would persist as a stable suspension on cooling. All the tests were purposely run in the cold, since it was particularly desired to avoid having to employ any heating equipment.

Powdered Coal Report Issued

"Pulverized Coal Systems in America," by Leonard C. Harvey, has been issued in the form of a third edition by the British Fuel Research Board. This document is intended to give English industrial engineers the latest and best information on achievements in powdered coal operation in the United States. It is even better adapted for use by American engineers, since the equipment and methods described would be more readily adaptable to other American plants than to British conditions. Full engineering information is given regarding mechanical equipment and considerable data on costs for numerous specific plants. The report can be purchased for 5s. from His Majesty's Stationery Office, Princes Street, Westminster, S. W. 1, London.

Mercury Vapor as an Industrial Heating Medium

An Outline of This System, With a Discussion of Various Other Sources of Heat at High Temperature Available for Industrial Use

By Crosby Field

Vice-President, Chemical Machinery Corporation, New York City

TEMPERATURES in chemicals undergoing reactions above ordinary room temperatures up to 1,000 deg. C. (1,832 deg. F.) are often obtained by means of direct flame or the hot gases given off by ordinary fires. Unfortunately this method of heating at these elevated temperatures is not accompanied by either economy of heating surface or effective temperature control. As a result several methods of indirect heating have been developed, each of which has its advantages and disadvantages and some of which are particularly effective between moderate limits of temperature range. It is the purpose of this article to describe a system of heating, cooling and temperature control that is very effective between the temperatures of 180 deg. C. (356 deg. F.) and 500 deg. C. (932 deg. F.).

Neglecting the secondary effects of radiation, conduction or the like, the primary sources of heat at high temperatures available for industrial applications are:

1. Direct flame.
2. Hot gases.
3. Steam.
4. Superheated steam.
5. Circulating water under low or high pressures.
6. Circulating oil.
7. Baths of molten materials.
8. Electricity.
9. Mercury vapor.
10. Vapors of special substances.
11. Infrequent adaptations of the laboratory sand and water baths.

About the cheapest method of indirect heating and one that affords great ease of control is ordinary saturated steam, and this is used most effectively up to temperatures of about 200 deg. C. (392 deg. F.), which is at about 160 lb. gage; or, allowing the usual temperature drops through the heat transfer surface and the customary pipe-line drops, a boiler pressure of 200 to 250 lb. per sq.in. (See the author's article "Exhaust Steam at High Back Pressures," *Chem. & Met.*, Jan. 1, 1919.) There are few chemical plants, however, that justify the distribution of

steam at pressures much over 150 lb. per sq.in. This would normally limit the maximum temperature (after making the usual allowances) of the reaction up to about 180 deg. C. (356 deg. F.).

It is unfortunate that this limit to the temperature at which saturated steam can be used with moderate pressure is so low, because there are many important processes requiring temperatures well above this figure.

HEAT TRANSFER

In many processes where heating is a necessary operation, the temperature required precludes the use of steam as a heating medium. This has, in the past, caused the engineer to turn to direct firing for his heat; and, in many cases, he is thus prevented from maintaining close control of his process. The author of this article presents an alternative method for heating operations where steam will not serve. The mercury vapor system he advocates allows a control at least as close as that obtained with steam. Its application will be of undoubted service in many industries.

A UNIT PROCESS OF CHEMICAL ENGINEERING

The first obvious method of obtaining the increased temperature was by superheating the steam, and there are many superheated steam systems in use. Superheated steam, however, has little in common with saturated steam, in so far as its use as a heat transfer medium is concerned. The reason for this, which is also the reason for the excessive difficulty encountered with most mediums employed for the higher ranges, becomes apparent from a brief consideration of the fundamental relations governing heat transfer.

The rate of heat transfer from one medium to another, through a heat-conducting body presenting two surfaces, one to each medium, is limited by the ability of the conducting body to conduct the heat, and by

conditions on either surface and immediately adjacent thereto. The former limit, that of conduction, is usually so far in excess of the other (surface) limitations that it can be omitted. Either of the surface conditions, or so-called "films," may become the limiting factor. Inasmuch as we are not concerned here with a discussion of any particular substance to be heated, we shall assume that the limits on its side of the conducting body are well in excess of those on the heat transfer medium side—in other words, our material being heated will take readily all the heat that can be released through the film and surface action of that surface of the heat-conducting body over which the heat transfer medium passes. Under these conditions, the usual limits of heat transfer obtained are as follows, all expressed in B.t.u. per square foot per hour per degree Fahrenheit, and it should be here noted that under exceptional test conditions these usual limits may be exceeded:

Heat transferred from a hot gas, 3 to 5.

Heat transferred from a liquid, 10 to 50.

Heat transferred from a condensing vapor, 50 to 800.

It is obvious from the above that by taking steam out of the saturated vapor class by superheating it, the rate is reduced many times. In the case of a superheated vapor, this condition is further aggravated by its very low specific heat and its low specific volume. This naturally results in a very great drop in temperature for each heat unit given up, and consequently either the steam must be very much above the temperature of the material being heated, or large and uneconomical heating surfaces must be provided. Again, when transportation or distribution of the vapor is desired, large pipes, heavy insulation and special long radius fittings are required.

The net result has been that excepting where the steam is of great value because of the ability to introduce it in its superheated form into the material being heated for some special purpose such as steam distillation or steam sublimation, superheated steam is not now used as extensively as formerly. It must be understood that in making this statement I am not referring to the slight degree of superheat that is given most steam as it leaves the boiler in order to insure its being received

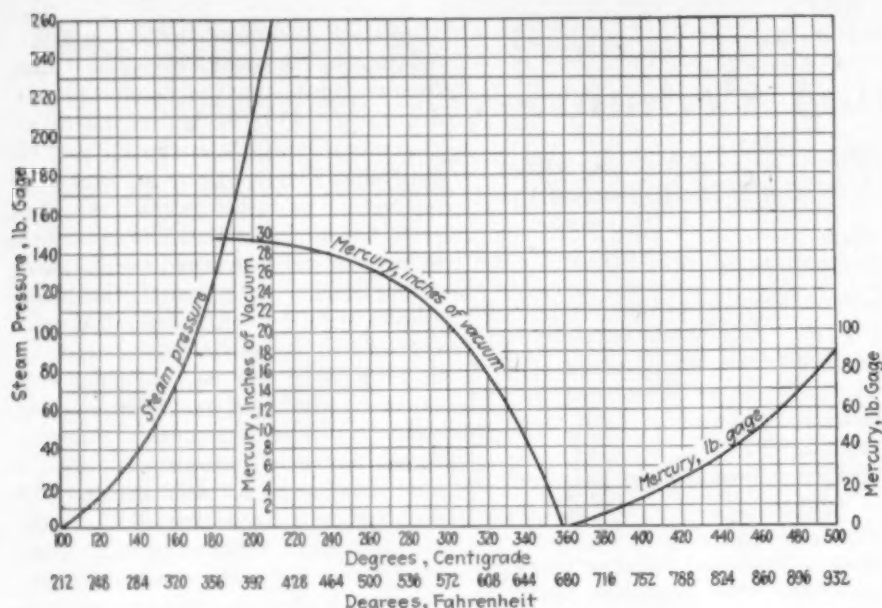


Fig. 1—Boiling Points of Water and Mercury

This chart shows the range of effectiveness of mercury vapor heating as compared to steam heating

dry and saturated at the point of use, because such superheat is so small in magnitude as to affect the temperature at the point of use very little.

The above comments on superheated steam also explain why hot gases are used so little where accurate temperature control is required at high temperature or where economy of heat surface is a prerequisite. It is obvious that a large heat transfer flow through any usual heat-transferring surface for such a slight coefficient of heat transfer will result in a very great temperature drop in the gas transferring the heat, and that therefore one part of the heat transfer will take place at a temperature very much greater than another. Inasmuch as most chemical reactions require an effective temperature control within a comparatively narrow range, this excess temperature results in the production of byproducts not desired in the main

reaction, and this tendency is very greatly exaggerated whenever the substance being heated is a solid or viscous melt or a cold tar material that can decompose readily.

A system that seeks to eliminate the disadvantage of a gas in its distribution and simultaneously obtains the advantages of the higher heat transfer coefficients has been developed abroad, but so far has not been used very much in this country. This method comprises the circulation of superheated water in which the circulating water is held under very appreciable pressures and thus is made to transfer its heat at temperatures far above its ordinary boiling point. The particular disadvantages to date of this system have been difficulties in obtaining the pumping equipment required to procure the rapid flow of water necessary to obtain high heat transfer, and further to obtain vessels designed with strength enough to withstand the pressures required. In order to overcome the latter difficulty one firm has successfully exploited a cast-iron vessel in the walls of which wrought metal tubes have been cast. Installations of this type in this country are, however, quite few in number.

The use of a substance other than water to transfer heat has been tried many times and the one most used has been a high flash point oil. There are several good circulating oil systems on the market. The disadvantages of the use of circulating oil are the hazards involved in the heating, pumping and piping of a substance

that is so flammable as oil, and further a substance which when maintained under a high temperature for long periods results in an appreciable amount of decomposition resulting in tarry residues and a certain not-to-be-overlooked percentage of loss through volatilization. Oil systems have been used within a temperature range of 160 deg. C. (320 deg. F.) to 240 deg. C. (464 deg. F.). The writer has been informed that circulating oil has been used for even higher temperatures, but he has not operated any systems above 240 deg. C.

It will thus be seen that the range above 240 deg. C. has been almost entirely left to direct heating, although many attempts have been made, by the use of lead or other metal baths or electricity, to introduce some method of effective temperature control. The mechanical difficulties involved in the use of molten metal such as lead baths and the corrosion present when such materials as liquefied sulphur are attempted have restricted the use of such materials very greatly, so that there are few, if any, large installations in operation at the present time. Electricity in certain localities, where it can be obtained cheaply, has been effectively used for some special purposes, but its adaptation has been limited to date, both because of the usual expense involved and also because of the lack of careful design necessary to obtain the desired effects in the particular case involved.

MERCURY VAPOR HEATING SYSTEM

In order to overcome these difficulties the writer developed a mercury system of heating, cooling and temperature control, which has several important features covered by patents and patents pending. The first commercial installation was successfully operated in 1915, and there

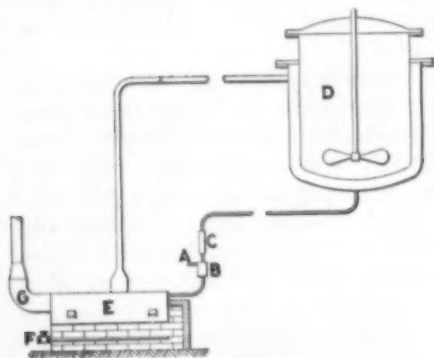


Fig. 2—Application of Mercury Vapor Heating to a Sulphonator

This is the simplest form of the system as applied to a strictly endothermic reaction.

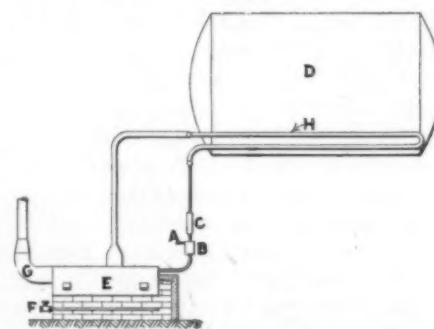


Fig. 3—Application of Mercury Vapor Heating to a Still

The alternative application shown here is a variation of that shown in Fig. 2.

have been to date twelve installations aggregating 650 boiler-horsepower. These installations have been as follows:

ing system may be attached to ordinary coils as with steam. Such an installation is shown in Fig. 3. The high rate of heat transfer and

Date	Location	Capacity B.t.u. Per Hour	Fuel	Use
1915	Wappingers Falls, N. Y.	1,100	Oil	Sulphonation of naphthalene and similar purposes
1916	Wappingers Falls, N. Y.	1,500	Producer gas	Distillation of B. N.
1917	Wappingers Falls, N. Y.	1,500	Producer gas	Coal-tar product distillation
1918	New York City	5,000	Gas	Dyestuff intermediates
1920	New York City	50,000	110 volt electricity	Dyestuff intermediates
1921	New York City	100,000	110 volt electricity	Chemical manufacture
1922	Wilmington, Del.	30,000	Gas	Petroleum distillation and cracking
1922	Wilmington, Del.	12,000	220 volt electric	Coal-tar product distillation
1923	Marcus Hook, Pa.	225,000	2300 volt electric	Chemical manufacture
1923	Buffalo, N. Y.	1,500,000	2300 volt electric	Chemical manufacture
1923	New York State	150,000	220 volt electric	Chemical manufacture
1923	New York State	100,000	220 volt electric	Chemical manufacture

The range through which this mercury vapor heating system is most effective is shown in Fig. 1. It will be noted that the range covered from 180 deg. C. to 500 deg. C. renders it applicable for use from immediately above the range of moderate pressure steam to a point beyond which such refined temperature control is not needed. In its simplest form the mercury heating system is shown in Figs. 2 and 3.

The boiler *E* is mounted in a brick setting and contains the mercury. It is heated by any means such as oil or gas controlled by the valve *F*, the waste gases passing up the stack *G*. The mercury vapors, delivered by the boiler, flow into the jacket of the vessel to be heated *D*, the condensate returning through the cooler *C* and separator *B* to the boiler for re-evaporation.

The control of the system is by means of the pressure exerted upon the boiling mercury. A vacuum or pressure connection *A* is made to the separator and by controlling this pressure it is possible to raise or lower the temperature 50 or 100 degrees within a few minutes.

For heating stills, evaporators or similar equipment, the mercury heat-

large temperature drop obtainable give extremely high rates of heat input with very small heating surface. By this means the maximum output from such apparatus may be obtained without danger of overheating.

In case of emergency or where instantaneous cut-off of heat is required, the vacuum is broken by means of a vent valve, and instantly the boiling ceases and no more vapors are given off. The fire is then shut down until operation is to be resumed. The high heat content and rapid turnover of the mercury in the system give very high capacities with a small mass of that substance. Units may be brought up to full operating capacity in from a quarter to half an hour and shut down in 2 minutes. They start equally well in cold or hot weather.

In actual installation the mercury boiler of the special design developed has been found to be a very small size in proportion to the vessel being heated, which is due to the facile heat transfer properties of mercury. As a result a very simple installation for temperatures under 350 deg. C. is shown in cross-section in Fig. 4, drawn to approximate scale. The mercury boiler *A* generates vapor that passes through pipe *B* into jacket *D* of reaction vessel *C*, whence it is condensed and returns through return pipe *E* to the boiler *A*. In order to insure the jacket *D* being completely filled with condensing mercury vapor and to control the pressure and the subsequent temperature under which this vapor is being condensed, a vapor pump *F* is provided, connected to what is called a "mercury balance tank" *H*, so that the mercury is caused to bubble through liquid mercury in this tank, as the level of the liquid mercury *G* is always above the outlet end of the pipe. Several types of pumps have been used, including the Nash Hytor

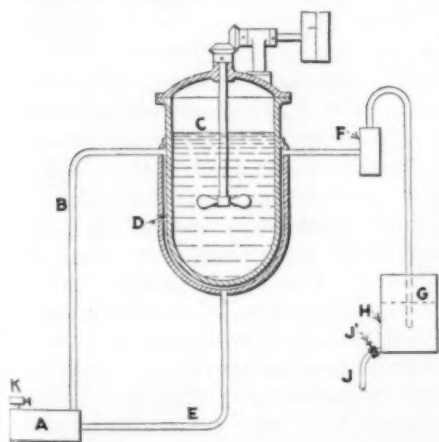


Fig. 4—Mercury Vapor Heating as Applied to a Reaction Vessel

The first simplification of the system after practical use is here shown.

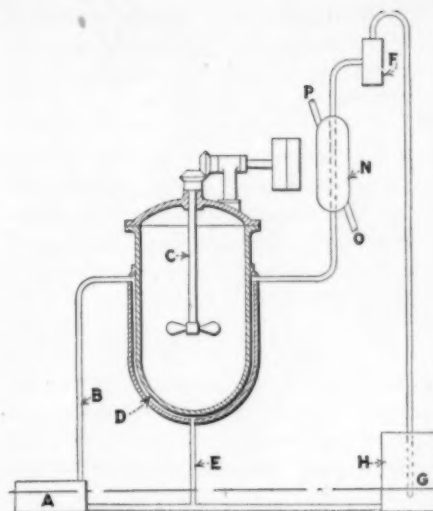


Fig. 5—Another Application to Reaction Vessels

The sketch shows a later and more common layout of the system shown in Fig. 4.

with a liquid mercury seal. If for any reason an unusually large quantity of mercury vapor remains uncondensed in the jacket *D* and passes on to be condensed in tank *H*, it may be eliminated at any time from *H* through outlet pipe *J* and controlled by the valve *J'*. This liquid mercury may be returned to the system through the valve *K* opening into boiler *A*.

A refinement of this system is shown in Fig. 5. Here the surplus mercury vapor from the jacket *D* is condensed in the condenser *N*, cooled by water flowing through the jacket entering from pipe *O*, and leaving at *P*. Any vapor not condensed is carried on through pump *F* into the balance tank *H*, as in Fig. 4, but *H* is permanently connected to *A* through the common return drain system *E*. In service this method is utilized more than the one shown in Fig. 4, although the latter has seen excellent service in a small installation.

Another feature of the mercury system which has been worked out successfully is the maintenance of temperature in an exothermic reaction. This is done by surrounding the vessel with a jacket of liquid mercury boiling at a temperature predetermined and controlled by regulating the pressure in the jacket. In other installations coils containing liquid mercury may be installed in the vessel in lieu of a jacket and the control of the temperature of vaporization is obtained by controlling the vapor pressure of the mercury being boiled.

The combination of the heating and cooling properties of mer-

cury and mercury vapor is shown schematically in Figs. 6 and 7. Referring to Fig. 6, the system is so operated as to maintain a level of liquid mercury along the line XY, and the boiler A carries the boiling mercury up to that point. First consider the system as a purely heating system. In this case the vapor coming off the boiling mercury in A escapes through the pipe B and condenses in jacket D, and in condensing tends to increase the height of the level of mercury in jacket D. This control causes a flow through return pipe E into boiler A. Any uncondensed mercury vapor flows through pipe P into the air condenser M, and there being condensed it increases the level of the mercury in M, which of course causes a flow

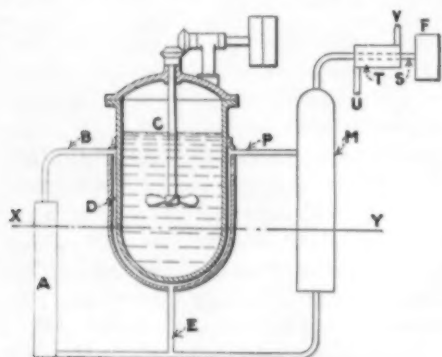


Fig. 6—Combined Heating and Cooling System

When an endothermic reaction changes to exothermic beyond a certain critical temperature, the above system is used.

of returning liquid to A. The proper pressure is maintained on the system by means of the pump F.

This system may be used for cooling quite readily by stopping the flow of heat into boiler A, whereupon the reaction vessel C becomes the boiler and tends to boil the liquid mercury in jacket D, thus cooling the contents of the vessel. In this case the boiling vapor from D flows through P into condenser M, and is returned to A through E. Any excess mercury vapor in this case which fails to condense in M is condensed in the water jacketed condenser T, into which cooling water enters by pipe U and leaves by V.

It is frequently desired to heat materials wherein there is danger of an excessive temperature rise because of heat generated in sources other than the heating system, as, for example, when processing an exothermic reaction. There is also that case where the reaction is endothermic up to a certain critical temperature, above which it suddenly

becomes exothermic and frequently very dangerous. In either case the system shown in Fig. 6 is very useful. When operating under these conditions heat is supplied the boiler A and the vapor flows through B into jacket D, heating contents of vessel C. If, due to any condition within the vessel C, the temperature of the contents begins to rise above its normal value when receiving heat from the mercury vapor, the first thing to occur is a reduction in the heat transfer between jacket D and the interior of C, due to a decrease in the temperature difference. If the exothermic reaction still continues, however, it will reach a point wherein its temperature is slightly above the temperature in D. Immediately the condensed mercury liquid in D begins to reboil and the vapor generated in both boiler A and jacket D are condensed in M with the end result of cooling the contents of C. In case the load on condenser M becomes too great, then of course the water-jacketed condenser T assists in this cooling.

The system shown in Fig. 7, of which there is at present about 300 boiler-horsepower in operation, is used where it is not convenient to place the boiler A at a level that will maintain the liquid mercury in it along the line XY, or where it is preferred to use a horizontal instead of a vertical boiler. This system operates as follows: Vapor from boiler A (in this case heated by electricity) passes through vapor header B into baffled jacket of reaction vessel C. Condensate returns through lines R to separator and control W. Vapors in excess of those condensed in the jacket flow through P and are condensed in air-cooled condenser M and return through the separator to the boiler for recirculation.

Separator W maintains the desired liquid mercury level XY and thus maintains liquid mercury in contact with the bottom of the reaction vessel C in readiness to dissipate excess heat should any become evident, as occurs, for example, when the contents of the vessel C suddenly change from an endothermic reaction to an exothermic. A pressure corresponding to the desired temperature of the boiling mercury is maintained on separator-control W by adjustment at the control board, which control board is frequently placed a considerable distance from the vessel being heated.

Where more than one reaction vessel C is to be heated or cooled, or

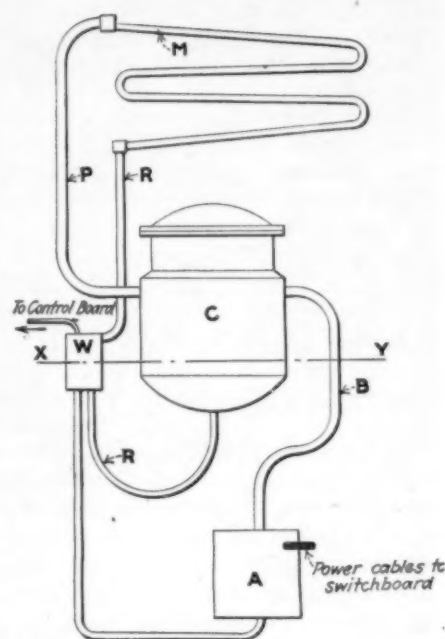


Fig. 7—Variation of the Combined Heating and Cooling System

When structural reasons prevent the use of the layout shown in Fig. 6, that shown in this sketch is recommended.

both, vapor header B may be part of a general piping system, in which it feeds the several units, each controlled by a separate valve actuated from the central control board. By this method each vessel, although connected to the one general system, may be heated or cooled independently of all other units. One such system at present in operation has six separate units operating at different temperatures, and on three different floor levels.

When a system like that described is desired for heating only, then the arrangement is the same, excepting that the level of liquid mercury XY is maintained below the bottom of the jacket of the reaction vessel C, by lowering the separator control W.

A cross-section of one of the successful installations now in operation is shown in Fig. 8, from which the simplicity and economy of installation of this system will be apparent.

These systems have been rendered possible because of the advantages of easy application, the control of wide temperature range, the safety of application and the high efficiency. The use of the latent heat of vaporization of mercury makes possible high capacities with small boilers and the use of small pipe lines for distribution. The rate of heat transfer is comparable with steam and enables operation with a minimum amount of heat surface. The effective temperature control permits the use of larger temperature drops

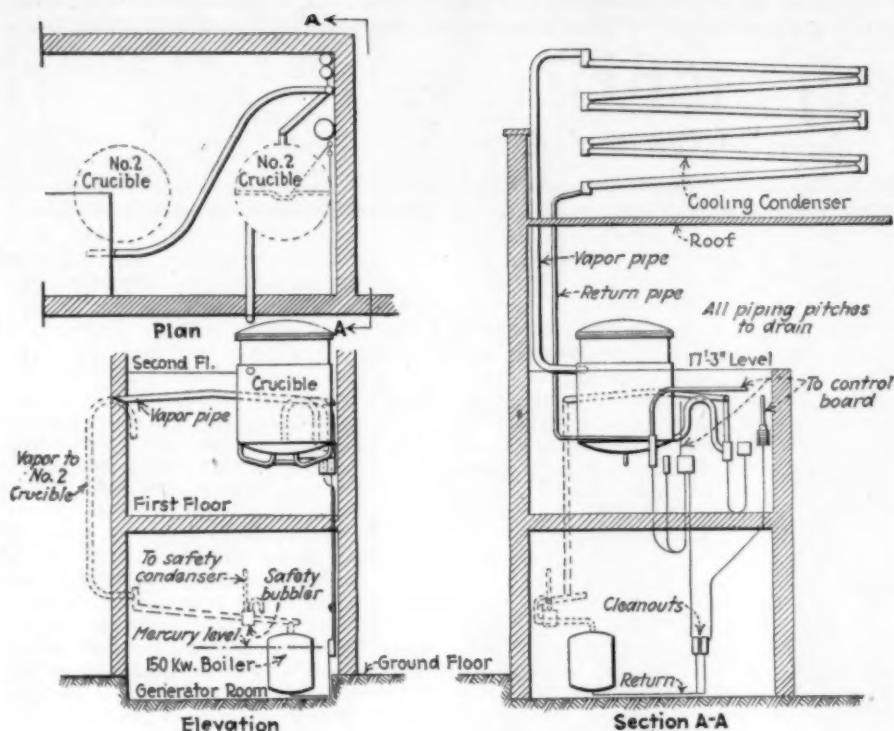


Fig. 8—Commercial Mercury Vapor Heating Installation

This cross-sectional drawing shows one of the large heating systems of this type now in operation.

with a proportionate increase in the rate of heat transfer. The heating medium, mercury, is a heavy metal inert to most substances and easily separated therefrom. Its boiling point is sufficiently high to permit its use generally under vacuum, which eliminates the possibility of contamination and permits easy detection of leaks. The art of design and welding has been developed during the past 9 years to the point where properly designed and installed mercury heating systems give little or no trouble from leaks. Another method of protection against leaks by the use of amalgamating materials for outlets of pumps, for stuffing boxes and for joints is being developed.

The injection of mercury vapor into the product being heated and the easy separation by decantation therefrom due to the heavy specific gravity of the liquid mercury is a special case that has found application both where the mercury is chemically inert to the material thus being heated and also to those products where the presence of the mercury in this form causes a catalysis, or where the mercury itself takes part in the reaction. These special cases have not sufficient application at the present time to render necessary more than brief mention.

Photographs of these various installations are not available for publication, largely because the owners of the systems do not care to divulge particulars regarding their processes and their desires in this matter must, of course, be respected.

The advantages of this system of heating, cooling and temperature control may be briefly summarized as follows: Effective temperature control, elimination of hazard, any required temperature up to 500 deg. C. (932 deg. F.), low installation cost, low operating cost, low maintenance cost, immediate "pick up" from one temperature to another, small building space, high heat transfer, high effective temperature drop available, simple attachment to any type of apparatus, can use any source of heat as oil, gas, coal or electricity, no overheating possible, quick addition of heat, quick abstraction of heat, simplicity of operation—little or no attention, operating data available for design of new installation.

Oxidation of Ceramic Wares During Firing

In connection with an investigation of the oxidation of ceramic wares during firing, being conducted by the Department of the Interior at the Columbus, Ohio, experiment

station of the Bureau of Mines, a study of the effect of varying the rate of gas flow and of heating on the decomposition of pyrite in clay has been made. This work will be extended to include a number of typical fine-grained commercial clays. It is felt that this work may have a very practical bearing on the method of firing ceramic kilns.

Self-Lubricating Bearing Reported

A metal from which self-lubricating bearings can be made has been developed within the last year by the General Motors Research Corporation, according to *Automotive Industries*. It is an absorbent copper-tin-graphite bronze in which the graphite exists in finely divided state, evenly distributed throughout the bronze and interlocked between the crystals. Durex, which is the name of the new metal, is self-lubricating to the extent that it holds within its walls up to one-fourth of its own volume of lubricating material, which can be removed only by special methods. The oil within the bushing walls helps maintain an oily bearing surface. It may be wiped off, but the surface rapidly becomes oily again. This ability to replenish oil to the bearing surface insures the bearing against running dry. Additional lubrication is required by a bearing of this material only when the pressure and speed are very high. Oil in any quantity can be supplied to a bearing without fear of washing out the graphite, which is locked between the crystals of bronze.

Specifications Prepared for Olive Drab Paint

United States Government master specifications for olive drab paint, both semi-paste and ready mixed, are given in Circular 165 of the Bureau of Standards. This specification was prepared by the technical committee on paints of the Federal Specifications Board after carefully considering suggestions from paint manufacturers. It covers the requirements for a high-grade olive drab paint for outside and general use. The pigment shall contain not less than 35 per cent of white lead and not less than 30 per cent of zinc oxide, with necessary tinting colors. It must be free from organic colors and sulphide sulphur. Details as to composition of semi-paste and ready mixed paint and methods of sampling and testing are included.

Equipment News

From Maker and User

Problems in Waste Product Recovery and Air Purification

By Arthur L. Greene
Buffalo Forge Co.

Accompanying the growth of our large industrial centers with the consequent congestion of great masses of people, state laws have become steadily more stringent with respect to air requirements both inside and outside the factory and home. At the same time the danger of air pollution caused by smoke, chemicals, dust, etc., thrown into the air from industrial plants has constantly increased. With the passage of such laws it has become necessary for the manufacturer to cleanse the polluted air in some fashion before expelling it outside.

Means applied to this end have varied considerably both in form and manner, depending on the nature of the impurities, laws of the state wherein the individual factory is situated, the type of factory, surroundings, product, etc. The difficulties met in some lines, as might be expected, have been more severe than in others; in many instances experimentation of an extensive character is still under way to determine more efficient processes of eradicating from the air the harmful residue emanating from many of our industrial activities.

Difficulties encountered are not always associated, as is popularly supposed, with the method or system to employ; frequently it is a case of surmounting physical difficulties rather than those associated with mechanical design.

Troubles experienced in this direction by chemical manufacturers will illustrate most aptly, perhaps, the point just made. In this industry it is customary to use air washers to reclaim material and to wash the air before it is expelled. The difficulties experienced here are not ones concerned with the operating efficiency of the apparatus. On the contrary, the difficulties concern themselves with certain simple chemical reactions which destroy the structure of the air washers. The object of research here is to obtain a material that will not only withstand the chemical action but that will possess at the same time the other properties required for efficient operation. The Buffalo Forge Co., of Buffalo, N. Y., among other manufacturers, is devoting considerable time and research ability to this problem.

Rapid deterioration takes place in the air washers installed in certain classes of the chemical industry. A typical instance concerns an installation in a plant engaged in the manufacture of chrome-tanning chemicals.

The work to be performed here was the collection of the very fine dust of chrome-tanning chemical, the ingredients of which are chromic and sulphuric acid. The object of this collection was twofold: first, this material is very valuable; more important from the standpoint of preventing a neighborhood dust nuisance, it was quite essential that this chemical be prevented from escaping outside, as it is of a greenish cast and discolours everything with which it comes in contact.

An air washer of the triple scrubber plate type with flooding nozzles only was installed. The washer proved very satisfactory for the work, but the acid contained in the product soon reduced the galvanized-iron plates to ribbons. These plates were then removed and two deflectors put in, one closing off the passage through the washer to within a foot of the water surface, while the other one closed off the passage through the washer with the exception of a 1-ft. space at the top. This arrangement, together with a dust collector, resulted in the recovery of all but a very small fractional amount of the dust that reached this point. The action of the chemicals was again detrimental, however, and resulted finally in the installation of a dry collection system.

Undoubtedly many instances of a similar nature could be recounted by manufacturers in other lines. It is certain that air washer manufacturers are spending yearly large sums of money and considerable time in experimental work in order to obtain the perfect air washer material for this class of work. In connection with this one point it must be remembered that, as in everything else, there are certain basic requirements governing the application of a material or materials to air washer work. This applies in particular to the material used in making eliminator plates. Supposing a metal capable of resisting all chemical action, it would still be unacceptable unless it conformed to certain other predetermined characteristics, such as those of thickness, weight, cost, adaptability to form-

ing operations, rigidity, etc. All of these are factors of importance in determining the adaptability of a material to the particular job. In the past extensive experimenting has been done with galvanized iron, black iron, copper, aluminum, lead, glass, Monel metal, cypress wood, certain forms of tin, and a great many alloys. Many of these are used today for air washer work, the most commonly employed being galvanized iron and copper. Lead, for instance, while inert to most chemical solutions, lacks sufficient stiffness to make its use generally acceptable unless alloyed with antimony. Cypress wood, while resistant to the action of water and most chemicals, is difficult of construction and necessitates riveting or nailing; this allows corrosion to take place. Monel metal is generally acceptable from every other standpoint except those of cost and weight.

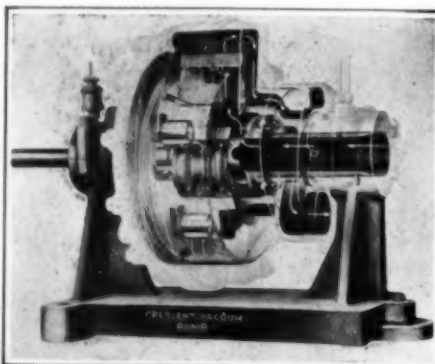
And thus each material either recreates an old or brings forth a new problem. But in adding new problems, new methods of approach are opened up; in the meanwhile constant experimenting and research work by our large heating and ventilating and engineering concerns is adding considerably to our knowledge of metallurgical science. In the end, this can be expected to produce fully satisfactory results.

Roto-Piston Vacuum Pump

A new and distinct operating principle is the feature of the Crescent Roto-Piston Dry Vacuum Pump, now being distributed by the Chicago Pneumatic Tool Co., of New York City. It is of the rotating piston type with two main moving members, as shown by the accompanying illustration, consisting of a rotor (or piston) and case which revolve, one within the other, about a fixed shaft at the same angular velocity.

The rotor, being smaller in circumference than the case, and set off-center to the case axis, is imparted a rolling motion as it describes an eccentric circle at each revolution. This movement maintains, without a liquid seal of any kind whatsoever, a crescent-shaped displacement of fixed capacity at all times, divided by the brass rotor-vane into intake and exhaust spaces which change from nothing to maximum in volume throughout each pumping revolution.

The absence of clearance spaces and valves eliminates unproductive capacity and provides a volumetric efficiency approximating 99 per cent. in exhausting to within $\frac{1}{2}$ in. of the barometer. Frictional wear, due to the general design, is exceedingly low. All working parts, ball bearings and bronze bushings are thoroughly lubricated by a force-feed system with the exception of the drive-



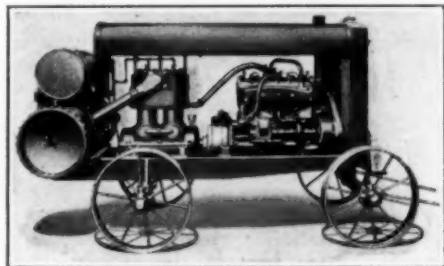
Roto-Piston Dry Vacuum Pump

shaft ball-bearing, which turns in compressed grease.

Short over-all dimensions allow its installation in limited spaces where it may be driven from line-shaft or by electric motor, either direct-connected or short-belt drive. This pump is now operating evaporators and driers in chemical and drug plants, providing high vacua for vacuum chucks in machine shops, and is used in numerous other applications requiring high vacuum service.

Small Portable Air Compressor

A small portable air compressor plant has been developed and is now being offered by the Ingersoll-Rand Co., 11 Broadway, New York. This compressor, designated as the 4½x4-in. Type Twenty, has a piston displacement of 60 cu.ft. per minute, and is built along the same lines as the larger Type Twenty portables. All of the proved features of the larger units are retained—e.g., duplex vertical compressor, direct-connected to a four-cylinder four-cycle tractor type gasoline engine; inclosed construction; circulat-



Small Portable Compressor

ing water-cooling system for engine and compressor with sectionalized radiator, fan and pump; compressor regulator and engine control for reducing speed during unloaded periods; one-piece cast steel frame; sheet-steel roof and removable side doors. The machine is compact and steady. Each part is accessible. Anyone can operate it. It is easy to move.

It is claimed that the 4½x4-in. Type Twenty portable opens up a new field. Its moderate cost makes it possible and decidedly profitable to use labor aiding compressed air equipment for work that was formerly considered too small to warrant the purchase of a compressor. It will supply necessary air for operating a paving breaker, "jackhammer" rock drill or other air tools, for road and paving repairs, for digging pipe trenches, for calking pipe, etc. Industrial plants having a central stationary air compressor should also have use for this machine. Such a unit will give good service when used for erection and repair work and in supplying air for the many odd jobs of painting, cleaning, etc. It can be moved from one job to another and can be used in places where air lines are not installed and would be too expensive to put in for temporary work.

This compressor can be furnished with a variety of mountings; steel wheels and axles; wooden artillery wheels with solid rubber tires and steel

axles; on a Ford truck; and on skids for mounting in a car or truck. This and other sizes of Type Twenty portable compressors are available with either gasoline engine or electric motor drive. The 4½x4-in. Type Twenty gasoline engine-driven portable compressor will operate, in general service, the following Ingersoll-Rand air tools: One BAR-33 "jackhammer" rock drill, or one CC-25 paving breaker, or one 56-H clay or trench digger, or two 22-SR backfill tampers, or two 2-S calking or chipping hammers, or one No. 90 riveting hammer.

Portable Washer for Sand Filtration Plants

The operation of washing the dirty sand from filter beds has hitherto been undertaken by hand, and has always been unsatisfactory, involving waste of water and poor results, in spite of labor expended. About 2 years ago Glenfield & Kennedy, Kilmarnock, Scotland, introduced the Peebles sand-washing machine, in the operation of which all that is required is a supply of water at from 4 to 5 lb. pressure, the sand being shoveled into the hopper of the machine, to be delivered at the other end.

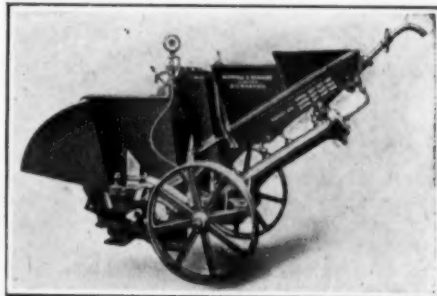
A portable machine has recently been introduced, which can be wheeled about by hand from one filter bed to another, so as to obviate transportation of the sand to and from the machine. The general arrangement recommended is to have at each filter bed a small flat concrete platform, in the middle of the bed if possible, on which the machine is wheeled and allowed to stand firmly while in operation, resting on the special foot provided. The machine is then connected with the low-pressure water supply. When the contents of the bed have been washed by passage through the machine, the latter is disconnected and wheeled to the next bed.

The machine consists essentially of a series of small washing chambers, of steel plate, fixed one behind the other on an inclined plane and connected underneath by a main cast-iron feeder pipe forming the bottom of the plane, resting between the wheels. The dirty sand is shoveled into the main hopper and falls out at the bottom through a small oscillating screen operated by a water motor, forming part of the equipment, being assisted also in its passage by a stream of water issuing from a small jet. The screenings, such as small pebbles and other debris, are ejected at the side of the machine, and the screened sand then falls through down to a lifting jet chamber underneath. At the lower end of this chamber is a water jet, and the intimate mixing of the falling sand in the upward rush of water results in the elimination of the great bulk of the dirt and impurities, which are lighter, these being carried over the weir, at the rear of the settling chamber, in a stream of exit water; the clean sand falls by gravity back again to the bottom of the chamber in front of a second and lower water jet. By this it is blown up an inclined delivery pipe into the first small chamber, also continuing upward for a short period in the chamber itself, the clean water going through the sand and

carrying away the impurities, upward and out of the top of the chamber. The heavier sand falls to the bottom again and is blown by the delivery pipe by a nozzle at the bottom into the next washing chamber, higher up in the inclined pipe, where the process is repeated. There are three such chambers in series.

The sand is propelled continuously through the apparatus, by the action of a series of water jets attached to the main water supply; the action consists essentially in repeatedly washing the moving sand with successive streams of clean water, and separating the impurities therefrom, on the gravity principle, in one chamber after another. The cleaning of the sand is also aided by the scrubbing action of each grain on its neighbors, especially because of the repeated changes of direction of flow in the machine. The clean sand finally issues from the end of the machine in a continuous stream, with clean water, being actuated finally by a jet in the bottom of the last chamber.

With only 5 lb. pressure of water at the nozzles, 4.15 tons of sand can be washed thoroughly per hour, using 8,000 gal. of water; whereas with the ordinary hand methods, involving much



Portable Machine for Washing Sand

labor, 60 to 80 lb. is generally required, and only about ½ ton of sand can be washed in the same time, and less efficiently. The fact that the machine is specially designed to work at low water pressure, always obtainable in the neighborhood of filter beds, is of considerable advantage. With 3 lb. pressure, the capacity of the machine is 2.55 tons (60 cu.ft.) of sand per hour.

The machine is light and compact, the ordinary fixed type being contained in a cast-iron, steel or concrete tank, 6x8x4ft. and weighing 1,232 lb. The portable machine weighs 1,456 lb., the over-all dimensions for the fixed and portable types, respectively, being as follows: Length, 9 ft. 6 in., and 9 ft. 9 in.; width, 3 ft. 10 in., and 3 ft.; height, 7 ft. 1 in., and 5 ft. 4 in.

Manufacturers' Latest Publications

Weston Electrical Instrument Co., Newark, N. J.—A new general catalog giving specifications and description of the complete line of Weston electrical instruments.

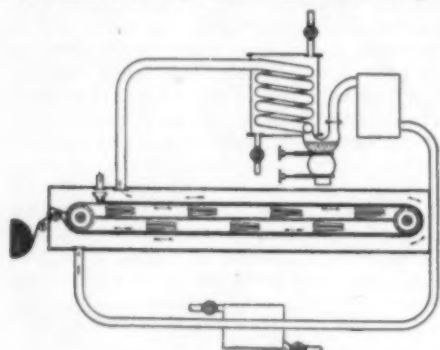
York Mfg. Co., York, Pa.—Bulletin 69. A catalog of the Type Y-16 vertical, single-acting, inclosed ice-making and refrigerating machine.

Jeffrey Mfg. Co., Columbus, O.—Catalog 385. A general catalog of coal- and ash-handling equipment, giving typical layouts, specification tables and full information on the many types of equipment used for this work.

Review of Recent Patents

Cellulose Acetate

At the end of the chloroform-soluble stage in manufacturing cellulose acetate there remains in the mixture a considerable amount of acetic values, such as acetic anhydride and acetic acid. Recovery of these in form suitable for further acetylation may be accomplished by methods suggested by Robert W. Cook, of Rochester, N. Y. Air is used to take up the vapors that are recovered by condensation or evap-



Recovery Apparatus

oration. Two types of apparatus are described. In one, the mixture is agitated in a powerful mixer and air is blown through until the acetic values are removed and the mass becomes powdery. In the other type, as shown, the viscous reaction mixture flows onto a moving belt of resistant material mounted in a chamber through which flows a current of warm air. The air and acetic vapors then pass to a condenser kept at about 60 deg. F., where the acetic vapors condense out in liquid form. The air is recirculated. (1,494,816 and 1,494,830, May 20, 1924.)

Non-Flammable Celluloid

Addition of an endothermic or heat-absorbing material to a pyroxylin plastic has been found to make it non-flammable. William G. Lindsay, of Newark, N. J., suggests the use of crystallized calcium sulphate or calcium tartrate with cellulose esters such as cellulose acetate or nitrocellulose in the presence of plasticizing agents such as tricresylphosphate. As an example, a material resembling ordinary celluloid but having fire-retarding properties may be made from 100 parts pyroxylin, 75 parts liquid tricresylphosphate and 125 parts calcium tartrate. For a leather-like compound the proportions of tricresylphosphate is increased to 200 parts. (1,493,207 to 1,493,210, assigned to the Celluloid Co., Newark, N. J., May 6, 1924.)

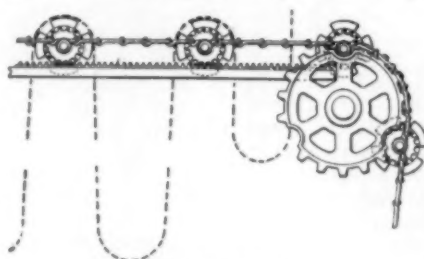
Chlorinated Rubber

Thomas A. Edison, Llewellyn Park, West Orange, N. J., prepares chlorinated rubber by placing thin sheets or strips of substantially pure rubber in

a closed glass or stoneware chamber through which carbon tetrachloride vapors are circulated. These cause the rubber to soften and swell so that when dry chlorine gas is introduced a highly chlorinated rubber is found. When the rubber has been completely chlorinated it will be in the form of a soft, sirupy mass containing some hydrochloric acid. The mass is stirred into hot water, washed free of acid and dried. The chlorinated rubber is adapted for various uses. Upon being mixed with naphthalene, it may be molded under heat and pressure for use as a veneer or outer record-receiving layer for phonograph records. (1,495,580, May 27, 1924.)

Festoon or Loop Drier

Florent Hinnekens, of Paterson, N. J., has noted that in drying certain materials in festoon or loop driers the cross-pieces produce irregular drying where they touch the material and corresponding marks or streaks remain in the dried material. By increasing the diameter of the cross-pieces, making them of a number of separate slats and mounting them as shown in rack and pinion arrangement, no portion of the



Loop Drier

material remains in contact with the cross-pieces long enough to cause the trouble referred to above. (1,494,307, assigned to Van Vlaanderen Machine Co., Paterson, N. J., May 13, 1924.)

Arsenic Acid

According to Oswald C. Behse, of Houston, Tex., lower grades of arsenious oxide than are usually considered suitable for oxidation to arsenic acid by means of nitric acid may be used with good results if a little hydrochloric acid is added. This acid is added at intervals in a total amount of about 0.02 to 0.06 per cent of the total mass of the batch treated. (1,493,798, May 13, 1924.)

Production of Alumina

By treating with nitric acid minerals that contain aluminum, solutions are obtained containing nitrates of aluminum and alkali metals. If additional alkali metal nitrate is added to the solid salts produced by evaporating the solution to dryness, the mixture will melt at a low temperature

and may be heated so as to decompose the aluminum nitrate, yielding alumina, which floats in the molten bath. The alumina may be separated while the bath is still molten or by extraction of the cooled melt. (1,494,835, Birger F. Halvorsen, Christiania, Norway, assignor to Norsk Hydroelektrisk Kvaestotaktieselskab, Christiania, May 20, 1924.)

Removing Baked Enamel

Baked enamel presents a hard, glazed surface that resists the attack of ordinary paint removers. For use in this connection, Day F. Clark, of Harrisburg, Pa., has developed the following formula:

	Per Cent
Methyl acetone	20
Denatured alcohol	20
Aqua ammonia, 26 deg.	10
Ammonium carbonate	10
Benzene	15
Xylene	10
Paraffine wax	5
Celluloid chips	5
Soap	5

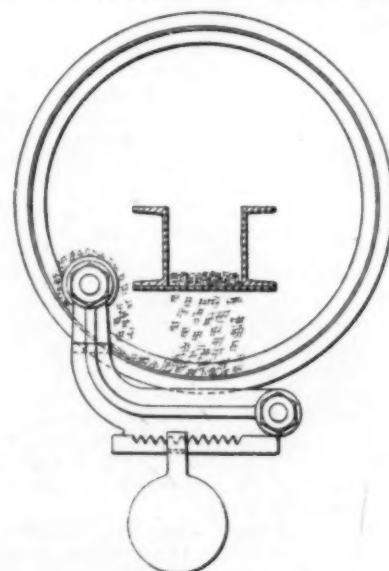
The benzene, xylene and methyl acetone are boiled and the wax and celluloid stirred in until thoroughly incorporated. After cooling, the rest of the ingredients are added. The composition is applied with a brush and allowed to remain from 15 minutes to 2 hours, when the enamel may be brushed off. (1,495,547, May 27, 1924.)

Evaporating Zinc Chloride

Ludwig Rosenstein, of San Francisco, has found that zinc chloride solutions can be evaporated in iron containers provided a quantity of metallic zinc is added so as to be in electrical contact with the iron of the container. (1,493,705, assigned to Great Western Electro Chemical Co., San Francisco, May 13, 1924.)

Thickening Paper Stock

Thin stock is fed to the inside of a rotating perforated drum. Because of the rotation, the stock tends to be carried up the side and roll back; the agitation set up assists in draining out



Paper Stock Thickener

the water. The partly dewatered stock is then subjected to pressure by means of the roller. It is frequently desirable to treat in this manner stock that is to be refined in order to control the fiber length of the product from the refiner, as this varies with the consistency of the stock fed. A thin supply frequently tends to produce long fibers, while a thick stock may give short fibers. (1,493,535; Anton J. Haug, of Nashua, N. H., assignor to Improved Paper Machinery Co., Nashua, N. H., May 13, 1924.)

Solid Sodium Silicate Mixture

The equivalent of solid sodium silicate may be obtained by mixing to-

gether powdered solid caustic soda and an incompletely dehydrated silicic acid hydrogel (obtained as a byproduct in the manufacture of sodium fluoride from hydrofluosilicic acid or as a natural product), the latter containing 1 to 15 per cent water.

The proportions of this mixture may be varied at will and the mixture may be compressed into block or tablet form. For use, the material is simply dissolved in water to give a solution of the refined concentration. Solution is hastened by raising the temperature, but it is not necessary to heat under pressure, as is the case with the fused sodium silicate. (1,493,708, Louis Schneider, of Barnard, N. Y., May 13, 1924.)

U. S. Patents Issued June 10, 1924

Gas Mixer. George E. A. Hallett, Dayton, Ohio.—1,496,673.

Manufacture of Halogen Hydrins. James Colquhoun Irvine and Walter N. Haworth, St. Andrews, Scotland, assignors by mesne assignments to Carbide & Carbon Chemicals Corp., New York, N. Y.—1,496,675.

Refrigerating Plant With Automatic Temperature Regulation. P. M. Jauvert, Toulon, France.—1,496,676.

Means of Refrigeration. Arthur C. Wright, Des Moines, Ia.—1,496,700.

Process of Treating Hydrocarbons. Joseph H. Riddick, Lynchburg, Va.—1,496,742.

Process of Separating Gases. Warren K. Lewis, Charles S. Venable and Robert E. Wilson, Cambridge, Mass., assignors to Goodyear Tire & Rubber Co., Akron, O.—1,496,757.

Tetrakisazo Dyes. Werner Lange, Berlin-Friedenau, and Ludwig Neumann, Berlin, Germany, assignors to Actien Gesellschaft für Anilin Fabrikation, Berlin, Germany.—1,496,780.

Composition of Matter and Method of Producing the Same. Harlan L. Trumbull, Hudson, and Herbert A. Winkelmann, Akron, O., assignors to B. F. Goodrich Co., New York.—1,496,792.

Device for Wringing Wet Leather. Edwin F. Hulbert, Milwaukee, Wis., assignor to Pfister & Vogel Leather Co., Milwaukee, Wis.—1,496,808.

Fuel Composition. Donald B. Keyes, New York, assignor to U. S. Industrial Alcohol Co.—1,496,810.

Stock Food and Process of Making Same. Earl C. Sherrard, Madison, Wis., dedicated, by mesne assignments, to the People of the United States of America.—1,496,833.

Process of Producing Pure Chromium by Electrolysis. Georg Grube, Stuttgart, Germany, assignor to Metal & Thermit Corp., Chrome, N. J.—1,496,845.

Mixing Liquids. Rudolf Knollenberg, Lubeck, Germany.—1,496,858.

Candy-Making Machine. John T. Hohberger, Chicago, Ill.—1,496,880.

Still. John L. Major, London, England.—1,496,899.

Explosive Using Liquid Oxygen. Guillaume Weber, Hayange, France, assignor to Les Petits Fils de Francois de Wendel & Cie., Hayange, Moselle, France.—1,496,914.

Spray Nozzle and Method of Distributing Liquid. Herbert W. Day, Wollaston, Mass., assignor to Spray Engineering Co., Boston, Mass.—1,496,924.

Welding Electrode and Method of Making Same. Walter H. Flood, Tooting, and Donald T. Smout, West Dulwich, London, England, assignors to Electric Arc Cutting & Welding Co., Newark, N. J.—1,496,930.

Weld and Process of Forming the Same. Thomas W. Lowe, Winnipeg, Man., Canada.—1,496,936.

Electrode and Method of Making Same. William G. Allan, Toronto, Ont., assignor, by mesne assignments, to John P. Scott, Toronto.—1,496,966.

Centrifugal Extractor. Dana H. Benjamin, Cleveland Heights, O., assignor to Henrietta C. Benjamin, Cleveland Heights, O.—1,496,973.

Alloy Steel for Metal-Cutting Tools. Edwin Corning, Kenwood, and Percy A. E. Armstrong, Loudonville, N. Y.—1,496,978.

Alloy Steel for Metal-Cutting Tools. Edwin Corning, Kenwood, and Percy A. E. Armstrong, Loudonville, N. Y.—1,496,979.

Alloy Steel for Metal-Cutting Tools. Percy A. E. Armstrong, Loudonville, N. Y.

Automatic Control Water-Gas Set. William H. Gartley and Owen B. Evans, Philadelphia, Pa., assignors to the U. G. I. Contracting Co., Philadelphia, Pa.—1,497,010.

Manufacture of a Cellulose Material. Alexander Ritschke, Duneberg, Germany.—1,497,028.

Drying Kiln. Alexandre Bigot, Paris, France.—1,496,084.

Method of Introducing a Steam Jet to a Water-Gas-Generator Fuel Bed. John S. Haug, Philadelphia, Pa., assignor to U. G. I. Contracting Co., Philadelphia.—1,497,098.

These patents have been selected from the latest available issue of the *Official Gazette* of the United States Patent office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.*'s staff, and those which, in our judgment, are most worthy will be published in abstract.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Apparatus for Vulcanizing Rubber Goods. Patrick M. Matthew, Edinburgh, Scotland.—1,497,112.

Apparatus for the Treatment of Oil Refinery Gases. Frederick A. Willard, McAlester, Okla.—1,497,128.

Decolorizing Cellulosic Material Such as Film Base. Edward S. Farrow, Jr., Rochester, N. Y., assignor to Eastman Kodak Co., Rochester, N. Y.—1,497,137.

Decolorizing Process. Edward S. Farrow, Jr., and Neil S. Kocher, Rochester, N. Y., assignors to Eastman Kodak Co., Rochester, N. Y.—1,497,138.

Vulcanization of Rubber-Latex Paper. Frederick Kaye, Ashton-on-Mersey, England.—1,497,146.

Paper-Pulp-Straining Machine. Paper and Ray Duster and the Like. John Paramor, Watford, England, assignor of one-half to Watford Engineering Works, Ltd., Watford, Herts, England.

Apparatus for Desiccation. Walter L. Fleisher, New York, assignor to W. L. Fleisher & Co., Inc., New York.—1,397,168.

Process of and Apparatus for Oxidizing Gases. Ingenium Hechenbleikner, Charlotte, N. C., assignor to Southern Electro-Chemical Co., New York.—1,497,173.

Intermediate Carrier for Cane-Sugar Mills. Joseph Meinecke, Paia Maui, Hawaii, assignor of one-half to W. A. Ramsay, Honolulu.—1,497,181.

Machine for Making Crucibles. William G. Moland, Philadelphia, Pa.—1,497,190.

Machine for Forming Earthenware Tanks. William G. Moland, Philadelphia, Pa.—1,497,191.

Machine for Coating Cardboard and Other Materials. Adolph Potdevin, Brooklyn, N. Y., assignor to Potdevin Machine Co., New York.—1,497,196.

Process and Apparatus for Dehydrating Magnesium Chloride. Charles Wheat, Peoria, Ill.—1,497,201.

Drying Rolls for Paper Mills. Robert P. Moodie, Ottawa, Canada.—1,497,223.

Manufacture of Vat Dye-stuffs. Maximilian P. Schmidt and Alfred Hagenboker, Blebrich-on-the-Rhine, Germany, assignors to the Firm Kalle & Co., Aktien Gesellschaft, Biebrich-on-the-Rhine, Germany.—1,407,231.

Gas Cooler. Henry Howard, Cleveland, O., assignor to Grasselli Chemical Co., Cleveland, O.—1,497,238.

Apparatus for Operating Water-Gas Sets. Pierre Plantinga, Cleveland, O.—1,497,246.

Preparing Useful Derivatives of Paraminophenol. Eugene Theimer, Newark, N. J., assignor, by mesne assignments, to Roy F. Steward, Washington, D. C.—1,497,251.

Method of Preparing Methyl Paraminophenol and Compounds Thereof. Eugene Theimer, Newark, N. J., assignor, by mesne assignments, to Roy F. Steward, Washington, D. C.—1,497,252.

Process of Alkylating Organic Compounds. Eugene Theimer, Newark, N. J., assignor, by mesne assignments, to Roy F. Steward, Washington, D. C.—1,497,253.

Process for the Treatment of Silicate Compositions. Robert L. Frink, Columbus, O.—1,497,263.

Zinc-Electroplated Articles. Joseph Haas, Jr., Muncie, Ind., assignor to Roessler & Hasslacher Chemical Co., New York.—1,497,265.

Process of Making Artificial Silk and Similar Products. Harry P. Bassett, Cynthia, Ky., and Thomas F. Banigan, Philadelphia, Pa.—1,497,321.

Process and Apparatus for Production of Coke at a Low Temperature. Albin Berthold Helbig, Berlin, Germany.—1,497,333.

Machine for Manufacturing Tubes and Other Hollow Bodies From Pulp. Howard Parker, Berlin, N. H., assignor to Brown Co., Portland, Me.—1,497,344.

Process for the Desiccation of Wood. Paul F. Dhe, Paris, France, assignor to Charles L. Maurer, Paris, France.—1,497,362.

Method of Enameling Pipe Joints. Thomas A. Wry, Lynn, Mass.—1,497,396.

Manufacture of Enameled Writing Tablets. Richard Zulauf, Frankfurt-on-the-Main, Germany.—1,497,397.

Paper-Machine Slice. Clarence E. Bruner, Oregon City, Ore.—1,497,403.

Explosive. Ernest L. Swift, Oakland, Calif.—1,497,413.

Process of Coating Metals. Henry C. P. Weber, Edgewood Park, Pa.—1,497,417.

Flavoring and Perfumery Extract. Hubert Grunenberg, New York, and Alexander Katz, Unionport, N. Y., assignors to Florasynth Laboratories, Inc.—1,497,439.

Method of Drying Double-Faced Corrugated Board. Richard E. Jones, Brooklyn, N. Y., assignor to Robert Gair Co., Brooklyn, N. Y.—1,497,446.

Bread-Making Flour Composition and Process of Making Same. Levi H. Blouch and Jacob H. Roop, Philadelphia, Pa., assignors to Nutrose Co., Inc., Philadelphia, Pa.—1,497,477.

Method of Treating Liquids and Apparatus Therefor. William S. Elliott, Pittsburgh, Pa.—1,497,491.

Adsorptive Carbon and Process of Making the Same. Newcomb K. Chaney, Lakewood, O.—1,497,543.

Adsorbent Charcoal and Process for Making the Same. Newcomb K. Chaney, Kew Gardens, N. Y.—1,497,544.

Treatment of Natural Gases. Georges Claude, Paris, France, and Eugene Jordan, Franconville, France, assignors to La Société et l'Exploitation des Procédés Georges Claude, Paris, France.—1,497,546.

Process for Electric Steel Furnaces. Joseph L. Dixon, Detroit, Mich.—1,497,554.

Process of Purifying Sodium-Sulphide Solutions. Henry Howard, Cleveland, O., assignor to Grasselli Chemical Co., Cleveland, O.—1,497,563.

Mold for Making Hollow Rubber Articles. Fred T. Roberts, Upper Montclair, N. J., assignor to Paramount Rubber Consolidated, Inc., Philadelphia, Pa.—1,497,592.

Preheating Kiln for Zinc Smelters. Adolph P. Schonaerts, Fort Smith, Ark.—1,497,595.

Manufacture of Sulphur. Carl Marx, Wyoming, N. J., assignor to Union Sulphur Co.—1,497,649.

Process of Sterilizing Food and Beverage Products. Frank J. Andress, Cincinnati, O., assignor to Gordon Weil and Bert Weil, both of Cincinnati, O.—1,497,657.

Regenerative Furnace. Harry M. Ridge, London, England.—1,497,664.

Book Reviews

Distillation Data

EINFACHE UND FRAKTIONIERTER DESTILLATION IN THEORIE UND PRAXIS. Prof. Dr. C. v. Rechenberg. 814 pages; 134 figures and curves; 85 tables. Schimmel & Co., Miltitz, Leipzig, Germany, 1923. Price, 17 gold marks in paper or 18 gold marks in half cloth.

In 1910 the author published the first edition of his book, "Theorie der Gewinnung und Trennung der Ätherischen Öle durch Destillation." Because of the fact that it now covers the whole field of distillation and has a great amount of added material and data, the present volume can be called a second edition of only a part of the first book. Its great enlargement and complete revision make the second book practically a first edition of a new book.

Although the author states that the literature has been covered to the year 1922, it is apparent that he has overlooked much of value, especially that done in America by Lewis and his co-workers in recent years. Calculations and methods of design of such important plant apparatus as stills, fractionating columns, etc., have not been treated and even the work of his own countryman, Hausbrand, on distillation and rectification has been omitted.

For these omissions he has somewhat compensated by including a discussion and examples of use of Duhring's rule for boiling point determination and by the immense amount of tabulated data. The latter alone makes the volume the most valuable treatise on distillation yet published, although the theory is not covered as well as in Young's "Distillation Principles and Processes."

A good deal of space is devoted to a rather non-mathematical discussion of the physical chemistry of evaporation, determination of temperatures and vapor pressures, etc. Other subjects discussed include the approximate calculation of boiling points, relation between constitution and vapor pressures, evaporation of mixtures and solutions, binary and ternary systems. The existence of a "nullpunkt der Verdampfung" (zero point of vapor pressure) is concluded, the temperatures corresponding to these points being calculated for fifty-one substances, most of which are organic. The discussion of fractional distillation in laboratory work seems much better and more complete than that of the plant work.

The two most important tables are the vapor pressure and boiling point tables. The vapor pressures are tabulated for temperatures at 10 deg. intervals from nearly zero to very high pressures. The boiling points are arranged from zero to 800 mm. pressures. Included in these tables are 489 substances, and they are followed by a well-indexed and very complete list of references for each substance. A part of the data was obtained by interpolation.

Lecat's "L'Azéotropisme" contains more data, but it is not in such form as to be readily used. Young's book is no doubt better for discussion and theoretical work on distillation, but does not contain so many data and its price is more than double that of the book here reviewed.

PAUL D. V. MANNING.

Books Received

Clay Products Cyclopedia

CLAY PRODUCTS CYCLOPEDIA, second annual edition. 293 pages, illustrated. Industrial Publications, Inc., Chicago. Price, \$3.

The excellent idea of providing a handy reference book for executives and operating men in the clay products industry, begun last year with the first edition of the Cyclopedia, has been developed and extended in the revision. More than forty authorities have assisted the editorial staff in going over the material, with the result that the 219 pages of data are of unquestionable reliability. The definition and statistical sections of the original edition have been combined into one editorial section by placing the statistical data on the lower part of the page on which the corresponding definition appears. Additional cross-references also make it easier to locate data. A departmental index of equipment and a catalog section add to the value of the book. For practical information on all phases of the ceramic industries there is no better source.

Energy Requirements in Steel Plants

ANHALTSZAHLEN FÜR DEN ENERGIEVERBRAUCH IN EISENHÜTTENWESENS (Data on Energy Requirements in Iron and Steel Plants). Prepared by the Heat Economy Bureau of the German Iron and Steel Institute. 74 pages, illustrated. Obtainable from Paul F. Hermann, Century Bldg., Pittsburgh. \$1.75.

An immense amount of data has been incorporated in this book, covering the energy requirements of all equipment in the iron and steel industry: Coke ovens; blast-furnace and pig-iron production; steel production by open-hearth, bessemer, electric furnace and other processes; rolling mills; furnaces and gas producers; steam engines, gas engines and other prime movers.

New Publications

THE HELLER & MERZ Co., 503 Hudson St., New York, announces the publication of a book entitled "Dyestuff Data for Papermakers." The text of this interesting book is confined to the use of colors in the paper industry, and is a complete treatise on the application and usefulness of colors in papermaking. The book is being distributed free to paper mill superintendents and gives the papermaker in compact form information which could not be gathered readily, if at all, from the general literature on dyestuffs. It is the result of 30 years experience with paper mills, and was compiled with the co-operation of paper mill superintendents.

"WHEN INSURANCE INSURES AND WHEN IT DOESN'T" is the title of a new booklet published by the American Appraisal Co., Milwaukee, Wis. The booklet deals with the use of appraisal in the proper placing and collection of insurance and contains

Readers' Views

Vegetable Tannin Resources

To the Editor of Chem. & Met.:

Sir—The writer has read with much interest the article entitled "Applied Research Pays Dividends in Leather Manufacture," by Alan G. Wikoff, in the issue of June 9, and he wishes to compliment you upon the clearness and conciseness with which this article is written.

I would, however, for the sake of correctness like to draw your attention to the last paragraph of this paper, which deals with the supply of natural tanning materials, in which it is stated: "It has also been questioned as to whether the supply of natural tanning materials would hold out long if everyone should demand shoes that were made from vegetable-tanned leather." This seems to be the impression among many people, while the true facts of the matter are quite the reverse.

On account of the scientific reforestation now being carried on by some of the large companies in the vegetable-tanning extract industry there will always be sufficient vegetable tannin to supply the needs of the leather industry. Much more natural tannin than required by the tanners, even if all the leather produced were made by the vegetable-tanning process, could be grown, from which fact will be seen the inaccuracy of this popular impression that the supply of vegetable-tanning materials as a whole is becoming limited.

Having been connected with the vegetable-tanning extract industry for several years, I can say authoritatively that more vegetable tannin extract could be produced than needed for the production of leather, if all leather were vegetable tanned, as long as the climate and soil of the earth remain unchanged.

THE TANNIN CORPORATION.

R. O. PHILLIPS,
Chief Chemist.
New York City.

a number of interesting charts on price fluctuations and the operation of the co-insurance clause. Copies will be sent upon request.

"STUDIES ON THE CHEMISTRY OF TANNING," by A. W. Thomas, M. W. Kelly and F. L. Seymour-Jones, of the Department of Chemistry, Columbia University. Bull. 14, March, 1924, from the Schools of Mines, Engineering and Chemistry, Columbia Univ., N. Y.

"WATT-HOUR METER ACCURACY ON LIGHT, LOW POWER FACTOR LOADS," by D. D. Ewing and D. T. Canfield. Circular 2, Engineering Extension Service, Purdue University, Lafayette, Ind.

THE IMPERIAL MINERAL RESOURCES BUREAU has issued pamphlets on Molybdenum and Vanadium, each giving statistics from 1919 to 1921 and each priced 6d. net. Copies can be obtained from H. M. Stationery Office, Imperial House, Kingsway, London, W. C. 2, England.

THE UNITED STATES PUBLIC HEALTH SERVICE has issued the following pamphlets: Mercurial Poisoning, by J. A. Turner, which is reprint No. 903; and Hydrogen Sulphide Literature, by C. W. Mitchell and S. J. Davenport, which is reprint No. 892.

NEW BUREAU OF MINES PUBLICATIONS: Bull. 203, Central District Bituminous Coals as Water-Gas Generator Fuel, by W. W. Odell and W. A. Dunkley; Tech. Paper 317, Silver in Chloride Volatilization, by C. M. Bouton, W. C. Riddell and L. H. Duschak.

NEW BUREAU OF STANDARDS PUBLICATION: Circ. 158, U. S. Government Master Specification for Surfacing Materials for Bituminous Built-Up Roofing.

News of the Industry

Summary of the Week

Domestic production of coal-tar dyes in 1923 was the largest on record and showed gain of nearly 44 per cent over 1922.

Prof. James F. Norris, on July 1, will become chief of the Division of Chemistry and Chemical Technology of the National Research Council.

Experts of Tariff Commission, as preliminary to vegetable oil investigation abroad, study substitution of oils in the New York market.

Commission representing naval stores industry will visit French markets to study operating conditions.

The date for submitting bids for fertilizer materials desired by the Egyptian Government has been postponed until June 30.

Japanese study methods of regulating dye imports employed in this country when dye and chemical control act was operative.

Margarine manufacturers will petition next session of Congress to modify laws governing production and sale of their product.

Government survey of paint industry will deal with problems in marketing mixed paints.

Helium Bill Expected to Pass Early in Next Congress

Passage of the helium bill is confidently expected early in the session of Congress which convenes Dec. 1. While there is keen disappointment that this bill did not pass at the session just closed, the real truth of the matter is that it would have been unusual for a bill authorizing an appropriation of \$5,000,000, for a purpose not thoroughly understood, to pass in the very short time that was available after the approval of the three Secretaries was secured. Much valuable and highly necessary educational work was done during the session. There still are some points which must be explained to the Committee on Mines and Mining of the Senate, where the bill met its only snag.

There is a general disposition in Congress to recognize the importance of taking full advantage of our resources of helium. To be able to operate lighter-than-air craft with a non-flammable gas constitutes a military advantage that appeals to all members. There is difference of opinion, however, as to just what precedents should be established in connection with the extraction of this gas for government use. The legislation was complicated by the withdrawal of a helium reserve in Utah.

Early in 1923 the Utah Oil & Refining Co., in the course of drilling operations on the Woodside dome, 6 miles from Price Station, on the Denver & Rio Grande R.R., tapped at a depth in excess of 3,000 ft. a high pressure of non-flammable gas. It was found that the gas contained helium. This resulted in an Executive order withdrawing the area. Questions immediately arose as to the equities of the Utah Oil & Refining Co. and the seven other

permit-holders on the area. An understanding has been reached with the Utah company, but the contract has not been signed as yet.

Record Production of Coal-Tar Dyes in 1923

Final reports to the Tariff Commission for its annual census of dyes and organic chemicals for 1923 show that domestic production of coal-tar dyes last year was even greater than was indicated in the preliminary report issued the last week in April. The complete figures give the output as 93,669,000 lb., more than 1,500,000 lb. greater than the preliminary report indicated.

The value of the 1923 production of coal-tar dyes was approximately \$51,050,000, calculated on the average price of 54.5c. per pound reported for sales. The total sales, it is understood, will be shown by the report as 6,000,000 or 7,000,000 lb. less than production, indicating a normal stock on hand at the close of the year.

The final report shows an increase in production of nearly 44 per cent over 1922, a record production, exceeding that of 1920, the former record year.

The commission's report for 1923 has been completed by W. M. Watson, color specialist of the Chemical Division, and will be sent to the printer soon. It is the most complete that has ever been compiled by the Tariff Commission. One of the chapters is devoted to the record production of byproduct coke in 1923, the output of coal tar being so great that its consumption as fuel became more general than ever before. The chapters relating to foreign trends in dyestuffs are fuller than heretofore has been possible.

Vegetable Oil Investigation Begins at New York

In order to secure information for the preparation of schedules for its inquiry into vegetable oils, the Tariff Commission has sent four of its experts to New York City preliminary to field work in this investigation under the terms of the flexible tariff. The party is composed of Dexter North and H. L. Lourie, of the Chemical Division; P. W. Bidwell, of the Economics Division, and T. Heacock, of the Accounting Section.

While the commission has definitely ordered an investigation only into cottonseed oil, peanut oil, soya-bean oil and coconut oil, it has directed a report from its staff on other vegetable and animal oils on the question of substitution relating to the four vegetable oils named in the cost inquiry.

Schedules will be prepared in accordance with possible substitutions, and it is possible that the commodities named in the flexible tariff investigation may be extended before active field work begins. The matter of substitutions is being looked into by the party now in New York.

Chile Will Sell Nitrate Lands

The Chilean Government will not contract a new foreign loan to cancel the 1924 deficit, according to the President's message to the new Congress, which assembled June 2. The estimated budget for the year is set at 405,540,499 paper pesos, and at 73,450,145 gold pesos. An additional balance inherited from special laws passed in 1923 amounts to 45,000 paper pesos and 68,046 gold pesos. Receipts are estimated at 90,197,000 gold pesos and 346,809,781 paper pesos. The deficit is to be met by the sale of nitrate lands.

Dr. William Campbell Receives First Howe Professorship

Appointment of Dr. William Campbell as first Howe professor of metallurgy at Columbia University, effective July 1, has just been announced. The Columbia trustees created the new chair in honor of the distinguished service of the late Henry Marion Howe, professor of metallurgy from 1897 to 1913 and president in 1893 of the American Institute of Mining and Metallurgical Engineers.

Dr. Campbell, long a member of the faculty of the Columbia Schools of Mines, Engineering and Chemistry and internationally known as a metallurgist, was born at Gates-head-on-Tyne, England, in 1876. He received the degree of B.S. in 1898 and that of Sc.D. in 1905 from Durham University, and in 1903 received the degree of M.Sc. from the Royal School of Mines and the degree of Ph.D. from Columbia. He was Carnegie Scholar in 1902 and Barnard Fellow in 1903. During the war he was a commander in the U. S. Navy and is now consulting metallurgist to the New York Navy Yard.

Dr. Campbell and John Alexander Mathews, who received the degree of Ph.D. from Columbia in 1900, have, it was also announced, been nominated for membership on the executive committee of the American Society for Testing Materials. Dr. Mathews was president of the Crucible Steel Co. of America, resigning to take charge of all the research work of this corporation.

Margarine Manufacturers Will Seek Change in Laws

Among the important subjects discussed at the convention of margarine manufacturers held at Atlantic City were the use of the term "margarine" in place of "oleomargarine," proposals for changes in the federal laws regulating production and sale of margarine, and the harmonizing of taxation of margarine in the various states. It was decided to petition the next session of Congress to modify the federal laws now in force and as applied to the margarine trade.

Officers for the ensuing year were elected as follows: President, B. S. Pearsall, Elgin, Ill.; vice-presidents, H. H. Kamsler and W. C. Potter, Chicago; recording secretary, Howard J. Rohan, Cincinnati; secretary-treasurer, Dr. J. S. Abbott, Washington, D. C.

Program Taking Shape for Detroit Meeting of A.E.S.

Considerable headway has been made in arranging an interesting program for the meeting of the American Electrochemical Society, which will be held at Detroit, October 2 to 4. Among the speakers already arranged for are G. H. Clevenger, who will read a paper on "Electrolytic Silver and Gold Refining at Pachuca," and J. J. Mulligan, of the U. S. S. Lead Refinery, Inc. Dr. Saklatwalla, chairman of the symposium on "Corrosion," reports having received favorable responses from several of the foreign members. Dr. M. L. Hartmann, of the Carborundum Co., is arranging

for a session on "Refractories for Electric Furnaces" and Dr. C. F. Hirshfeld is chairman of a symposium on "Industrial Electric Heating."

An additional attraction of the meeting will be a round-table discussion on "Analytical Methods in Electrodeposition." Dr. William Blum, of the Bureau of Standards, is in charge of this round table, which should prove of exceptional interest to the Electrodeposition Division. There will also be a round-table discussion on "Electric Furnace Cast Iron." G. K. Elliott, of the Lunkenheimer Co., Cincinnati, Ohio, will be in charge of this discussion.

Decline in Exports of Salt From Germany

The German salt industry is at the present moment passing through a critical and interesting stage. While the potash industry is complaining of a poor home market but satisfactory export, the rock salt industry is experiencing just the reverse. The home market is better than the export trade. The chief hindrance to increased production and sale is the abnormally high railway freights, which are as much as twice those of pre-war days. This means that the cost of transport to the nearest port is a most serious item. The capacity of the German salt to compete with the English depends entirely upon the return to cheaper freights on the German railways. As

this problem is identical for a number of different staple industries, there is great likelihood that the representations now being made from many quarters will soon bear fruit.

As regards the question of output, it is distinctly pointed out that production at present is being intentionally limited, not by the syndicate, with the alleged object of inflating prices, but by reason of the fact that there is no wisdom in raising salt for which there is no immediate sale. Inadequate coal supply for working the mines or for the refineries is no detriment to production. In point of fact, the salt industry, as far as its coal supply is concerned, is now almost independent of the Ruhr pit coal, and has adapted itself entirely to the use of brown coal. The latter is used in the form of briquets or even crude.

One cannot make any real comparison of the present state of the industry with that prevailing before the war, because, owing to the development of the foreign trade, the markets are quite different. The total sales, however, for the reasons given above, have fallen off. Whereas for the year 1922, 1,000,000 tons was exported, the foreign sales for 1923 amounted to about 700,000 tons. The total sales for 1922, inland and export, amounted to 2,500,000 tons, while for 1923 the total was 1,700,000.

It is necessary to correct an erroneous impression prevalent in the trade. The vacuum plants now working in Germany, particularly that in Stade-on-the-Elbe, have not been started primarily for the purpose of saving coal in the evaporating process. This refining industry uses as raw material brine obtained by boring and both raw material and recovery product differ from that from the Stassfurt rock salt industry.

S.P.E.E. Annual Meeting Will Be Held in Colorado

The Society for the Promotion of Engineering Education will hold its thirty-second annual meeting June 25 to 28 at the University of Colorado. Among the papers to be presented are one on "The Meaning of the Bachelor of Science Degree in Engineering," by H. S. Evans, dean of the College of Engineering, University of Colorado; one on "The Student as an Individual," by Carl E. Seashore, dean of the Graduate School of Iowa State University, and one on "Fifteen Years of Experience with a Five-Year Engineering Curriculum," by W. H. Burger and J. F. Hayford of the Northwestern University, Evanston, Ill. Addresses will be made by the president of the society, Dean P. F. Walker of the School of Engineering, University of Kansas, whose subject will be "Public Service Aspects of Engineering," and by Frank Aydelotte, president of Swarthmore College, Pennsylvania. Director W. E. Wickenden will report for the board of investigation and co-ordination.

On June 26 there will be a mountain drive, with a "beefsteak fry" in Boulder Canyon, followed by a camp-fire smoker and round-table discussion. Abundant entertainment and opportunities for trips will be provided throughout the convention.

Colloid Chemists Gather at Evanston

Following the program prepared by the colloid committee of the National Research Council, the second National Colloid Symposium was held in Evanston, Ill., June 18 to 20. More than 250 colloid enthusiasts registered and participated in the social and scientific activities, which included attendance at the June 20 meeting of the Chicago Section of the American Chemical Society. Harry N. Holmes and Ross A. Gortner presided at the symposium meetings. The conference was remarkable not only because of the large number of industrial men participating but also because of the distance from which many came to attend.

Although not organized under any society or institution, the symposium is expected to reconvene annually, probably with the colloid committee in charge of the program and local men in charge of other arrangements. Frank C. Whitmore, of Northwestern University, had full charge of local arrangements on this occasion. Theoretical discussions, apparatus demonstrations and practical applications of colloid chemistry were all included. Among the industrial subjects considered were photographic emulsions, soil colloids, plasticity of clays for ceramic use, rubber colloids and lubrication and plasticity. A technical report of the meeting will appear in an early issue of *Chem. & Met.*

Washington News

Naval Stores Industry Will Send Commission to France

A naval stores commission representing the American producing industry will sail July 9 for 6 weeks inspection trip in France. The primary objects of the trip are to study operating conditions in the French industry and to gain first-hand impressions of the extensive reforestation projects that have been carried forward in that country. J. G. Pace, of Pensacola, Fla., is the chairman of the commission. The other members are: Dr. E. T. Rose, Valdosta, Ga.; A. F. Carr, Bainbridge, Ga.; O. H. L. Wernicke, Pensacola; W. L. Fender, Valdosta; Alex. Stessoms, Cozdel, Ga.; Austin Carry, Forest Service, and W. L. Barnett, Mt. Dora, Fla.

So that the commission may be furnished with further information which it would not have time to gather for itself, the Department of Commerce has arranged a survey of the French marketing and distribution system. The French have been very enterprising in their conduct of the naval stores industry, and it is believed that there are many leaves in the book of their experience which can be taken with advantage by American producers and distributing agencies.

While the commission has no official status, the Department of Agriculture has been active in making arrangements abroad that will facilitate its work.

Egypt Seeks American Bids to Furnish Fertilizer

Some time ago it was announced that the Egyptian Government had asked for bids for 28,500 tons of fertilizer materials which were to be distributed among the small farmers of Egypt. In the hope of securing American offers, the date for submitting bids has been postponed until June 30. The first date set was June 15, but when no American bids were received the Egyptian Ministry in Washington announced an extension. The American trade commissioner in Egypt will arrange for personal representation at the opening for American firms that submit bids. The Egyptian Government is in the market at this time for nitrate of soda, ammonium sulphate, superphosphate and calcium nitrate.

Specialist to Study Marketing of Oils and Fats Abroad

John E. Wrenn, specialist in the Foodstuffs Division of the Department of Commerce, will sail July 4 to make a study of the marketing of American and competing vegetable oils and meat products in Europe. His investigations will extend over 4 months and will include all important countries of western Europe. They will be confined chiefly to marketing facilities and methods, production and transportation, distribution costs and trade regulations. Mr. Wrenn has been connected

with the Foodstuffs Division since 1921 as specialist in animal and vegetable fats and oils, meats and meat products. During the war he served as assistant chief of the fats and oils division of the U. S. Food Administration.

Japan May Adopt Our War-Time Control of Dye Imports

In connection with the report published last week to the effect that the Japanese Government had issued a decree requiring import licenses on coal-tar dyes and distillates entering Japan, it is asserted that the government was forced to take this step.

The day following the receipt of this information S. Yoshino, Secretary of the Japanese Ministry of Commerce and Industry and chief of the Bureau of Industry, called at the Department of Commerce to make inquiries as to the methods employed by this government during the period when the licensing system authorized by the dye and chemical control act was operative. Arrangements were made whereby Dr. Yoshino could make a study of the experience of the War Trade Board and of the State Department in the administration of that law.

While Japan's principal production is in sulphur dyes, it also has built up quite a pretentious list of other colors. It has been found, however, that the ordinary safeguards against German dumping were not adequate. The licensing requirement applies only to those countries which do not have commercial treaties with Japan. The United States has a treaty and licenses will not be required for shipments of dyes from this country. The licensing regulation, however, requires that all shipments of dyes be accompanied by a certificate of origin.

Dr. Yoshino will visit several of the European countries to study their method of license control.

Paint Survey Will Include Distribution Problem

One of the major phases of the commercial survey of the domestic paint industry, which is being undertaken by the Department of Commerce, will deal with the distribution problems in connection with the marketing of mixed paints. In order that this portion of the survey may be as comprehensive as possible, arrangements have been made for an early conference between representatives of the Chemical Division and of the committee in charge of the "Paint Up and Clean Up" campaign and of the "Save the Surface and You Save All" committee.

Dyestuffs Market in Argentina

During the 5-year pre-war period, 1909-13, Germany furnished 86 per cent and the United States 4 per cent of the 800,000 lb. of dyestuffs consumed in Argentina. During the war, however, the situation with regard to im-

ports was almost exactly reversed in that the United States supplied as much as 87 per cent of the country's requirements during one year.

The principal industries in Argentina using dyes are as follows: Textile manufacturers, hat manufacturers, leather trade, and manufacturers of paper, matches, soap, paints and varnish. The seasons of use vary to such a small degree that sales are made the year round. In the leather trade, colors are used mainly from June to November; hat manufacturers buy heaviest from July to November, using black, however, all the year round; and the textile trade is most active from February to May and also during October and November.

It is estimated that direct and sulphur blacks comprise 37½ per cent, and blacks of all kinds 60 per cent of the dyes imported by Argentina. A few textile firms use logwood as their principal blacks, but in general natural dyes are of comparatively little importance in the market. Soap factories use Metanil yellow to imitate soaps made from palm oil, and match factories use Rhodamine, Phloxine and Rose Bengale. It has been reliably estimated that the annual consumption of dyestuffs in this market will be about 880,000 lb. in a short time.

Smuggling of Dutiable Chemical Products Suspected

Discovery of the large-scale operations in the smuggling of narcotics leads to expression of hope in chemical circles that this incident will tend to spur the operatives of the customs service to greater zeal in the efforts to thwart the illicit entry of dutiable chemical products. The industry long has suspected that smuggled dyes and medicinals are finding their way into domestic channels of distribution, but those who introduced these smuggled goods into the country apparently are sufficiently skilled to avoid apprehension.

Phosphate Production in Tunisia Increased Last Year

A report from Harris N. Cookingham, U. S. Consul at Tunis, says the six companies engaged in the mining of phosphates in Tunisia reported a total production of 2,357,000 metric tons for the year 1923, as compared with 2,115,000 in 1922. The leading producer extracted over 70 per cent of the total for 1923. With the increase in the production, some local authorities seem apprehensive of a crisis of overproduction.

Drawback Granted

The Treasury Department last Wednesday approved drawback allowance on flooring cement manufactured by the Marble Loid Co., of New York, with the use of imported magnesium chloride and pulverized magnesite. Announcement also was made that drawback privilege had been withdrawn from the Jefferson Distilling & Denaturing Co., of New Orleans. This referred to manufacture of alcohol with use of imported molasses. The company no longer manufactures alcohol for export.

News in Brief

Paper Company to Increase Output—The International Paper Co. has a project on foot to increase the output of its plant at Three Rivers, Que. It is proposed to add two new machines, increasing the daily output from 300 tons to 450 tons. This is in line with the recently announced intention of the president of the company to build up the Canadian factories where the supplies of pulpwood and water power were abundant.

Excelsior Used in Dehydrating Oil—A number of oil companies operating in the Luling, Tex., fields, including the Texas Co. and the United North & South Oil Co., are trying out a new plan for dehydrating service, utilizing excelsior to remove emulsion. Many of the wells in this district have water with the oil, making dehydrating plants necessary. Heretofore electric plants of this character have been used, and the new plan, it is said, is equally efficient at considerably lower cost. Large gun barrels, formed of galvanized iron, are employed, the excelsior being packed in the bottom; the mixture of oil, basic sediment and water is then forced through the mass, the impurities being held back by the excelsior and the oil passing through at the bottom.

Funds for Chemistry Development at Harvard Soon Mature—Harvard University is completing quotas in its campaign for funds for various new buildings at the institution, and expects to have the fund for chemistry development mature at an early date. A total of \$3,000,000 is being raised for the division of chemistry, to provide for the construction of a new laboratory and the endowment of research. Of this amount an aggregate of \$2,080,000 has been secured, leaving a balance of \$920,000 to be obtained. The new laboratory will cost approximately \$2,000,000, as now designed, or substantially the amount now procured, the remainder of the fund to be employed primarily for the endowment of chemical research.

Ford Will Expand Metallurgical Research—Effective with the completion of a new experimental building at Dearborn, Mich., now in course of construction, the Ford Motor Co., Detroit, will expand its metallurgical research department, to be housed in the new structure. The building will be 200x800 ft., and will be entirely given over to this branch of service, with elaborate testing equipment and facilities. Extensive branches will be established for the compounding of alloys, heat-treating of steel and the like, with a large staff of metallurgists to handle all phases of work.

Oldest Engineering Corporation—Said to be the oldest industrial or engineering corporation in the world, the Great Copper Mountain Mining Co., Sweden, is arranging for an appropriate celebration of its 700th anniversary occurring early in the coming year.

Salt Plant for Alberta—The Alberta Salt Co. has operations under way for the establishment of a salt plant capable of producing from 15,000 to 20,000 tons a year, at Fort McMurray, Alta., Canada, 300 miles north of Edmonton. The salt claim which the company owns comprises approximately 50 acres, on which, it is claimed, there is 90 ft. of salt at a depth of 500 ft., then a layer of limestone, and another 100 ft. of salt.

Award Mineral Claims—Awards of additional war minerals claims were made at the Department of the Interior last week. The claims granted range from \$114 up to \$8,810. The act of Congress passed just before adjournment removing the limitation of the original law gave the Secretary of the Interior authority to resume payments of these claims after they had been held up because of lack of funds.

Application for Carbon Black Plant—The application for the Coltex Corporation for permission to construct a carbon black plant in Stephens County, Texas, was heard by the Railroad Commission recently at Austin and taken under advisement. The application was for permission to construct a plant to burn carbon black from waste residue gas from casinghead gasoline. State headquarters for the Coltex Corporation are located at Dallas.

Canadian Official Favors Export Tax on Pulpwood—James Lyons, Ontario Minister of Lands and Forests, speaking recently at a luncheon in Fort William, said that he favored placing an export tax of at least \$1 a cord on pulpwood that is now being shipped from Ontario to the United States, and he would advocate increasing this tax up to a point where it would conserve the Ontario pulpwood for Canadian mills.

Sale of Nitrate Company—It is reported that before the close of the present year the Lautaro Nitrate Co. will take over the assets and liabilities of the Lastenia Nitrate Co., which controls nitrate of soda deposits in Chile. The Lautaro company, which already owns one-half of the \$3,000,000 capital stock of the Lastenia company, is capitalized at \$4,000,000.

Wattle Bark Industry Stimulated—Advices from the U. S. Trade Commissioner's office at Johannesburg state that the wattle industry in South Africa has been stimulated by the rise in bark prices, and as a result it is understood that the Natal Tanning & Extract Co., Ltd., will reopen the Gold Reef bark mill at Melmoth, Natal. This plant has been closed for some time.

India Removes Duty on Sulphur—The recommendation of the Indian Tariff Board for the removal of the import duty of 15 per cent ad valorem on all kinds of sulphur imported into British India has been adopted by the Legislative Assembly.

Columbia Introduces New Courses of Study

The faculty of applied science, having in charge the Schools of Mines, Engineering and Chemistry of Columbia University, has introduced important new courses into the program of study and has established closer co-operation with the Columbia University School of Business in municipal engineering.

Co-operation has also been brought about with the National Institute of Public Administration, formerly the Bureau of Mining Research. Students in the Columbia University civil engineering course will be able to take advantage of the opportunities offered by the National Institute of Public Administration in courses for the training of the modern city manager. Other directions of specialization in civil engineering are in sanitary engineering, construction engineering, railroad engineering and hydraulic engineering. In metallurgy a new program of study is offered for the student who expects to obtain an expert knowledge of the physical properties of metals as related to other uses and the methods of testing them.

Chemical Salesmen's Association Holds Outing

The second annual outdoor party of the Salesmen's Association of the American Chemical Industry was held on Saturday, June 14. About fifty members of the association met at 10 o'clock at the Chemists Club, New York, and thence proceeded by bus and automobiles to Centerport, L. I. On arrival at Hall's Hotel a shore dinner was served. At the close of the dinner a brief business session was held, with Ralph Dorland presiding. A committee was selected to nominate officers who will be elected at the annual meeting in September. John Chew was selected as chairman of the committee and other members are Messrs. Somers, McNair, Thompson, Kilcommon, Wilmot and Atkins. The afternoon was largely given over to athletic sports. The baseball contest was won by the team captained by G. M. Dunning. Messrs. Bedell and Lind proved their superiority at quoits and Messrs. Maxwell and McKenna hurled the shot far beyond their nearest competitors.

Norris Goes to Research Council

Prof. James F. Norris, of M. I. T., is to be chief of the Division of Chemistry and Chemical Technology of the National Research Council, beginning July 1, 1924. He succeeds J. E. Zanetti, who returns to Columbia University next fall. Dr. Zanetti is at present in Europe attending the International Union of Pure and Applied Chemistry and other technical meetings.

Other changes in the technical staff of the Council have also been made, effective the first of the fiscal year. Prof. Joseph S. Ames is to be chairman of the Division of Physics, and Dr. David White, of the U. S. Geological Survey, will head the Division of Geology. Colonel Jewett continues as chairman of the Engineering Division.

Financial

The Standard Plate Glass Co. has declared an initial quarterly dividend of 75c. on the common; also regular quarterly dividends of 1½ per cent on the two classes of preferred.

The Procter & Gamble Co. has declared an extra dividend of 4 per cent on the common, payable in common stock, in addition to regular quarterly dividend of 5 per cent. Extra dividend is annual, and at the same rate as heretofore. The directors plan to increase the authorized capital stock from \$24,000,000 to \$25,000,000, with a view to payment of the annual stock dividend in 1925.

The Davison Chemical Co. announced last week that it will pay off at 106 on Aug. 1, 1924, all of its \$1,750,000 15-year 8 per cent sinking fund debenture bonds which were to mature in 1936.

The Tecumseh Mills, of Fall River, has declared a liquidation dividend of 40 per cent. This is the second liquidation dividend to be declared from the assets of the corporation, which were not included in the sale of the mill to the Davol Mills. The first liquidation dividend was one of 25 per cent, made early in May, so that a total of 65 per cent has been declared to date.

The Barnet Leather Co., Inc., has declared the regular quarterly dividend of 1½ per cent on the preferred stock, payable July 1 to stock of record June 27.

The India Tire & Rubber Co. has declared an extra dividend of 50c. a share and the regular quarterly dividend of \$1 a share on the common stock.

Purchasing Agents Association Elects Officers

The annual meeting of the Purchasing Agents Association of New York was held last week at the Builders Exchange Club, New York City. W. T. Hall, of Brewster & Co., was elected president for the ensuing year. Other officers elected were: first vice-president A. Fred Macklin, Consolidated Gas Co.; second vice-president, R. Eberhardt, Sperry Gyroscope Co., Brooklyn; treasurer, E. B. Fielis, New York & Queens Electric Light & Power Co. Executive committee: A. A. Hoffman, American Oil & Supply Co., Newark; J. H. Maust, W. J. Rainey Co., Inc., New York City.

New Oil Refinery for Canada

Nation's Oil Refineries, Ltd., is erecting an oil refinery of 1,000 bbl. daily capacity in Montreal East, Canada, and the work is being rushed to completion with the hope of an early commencement of operation. The company holds a substantial amount of the stock of the Ballard Oil Equipment Co., contractor and installer of oil-burning equipment. The new refinery is being erected to provide for the extension ultimately to 3,000 bbl. daily capacity.

Statistical Report on Chemical Production in Canada

The Dominion Bureau of Statistics has just issued its final report on the production of chemicals and allied products in Canada in 1922. This publication contains comprehensive statistics with comparable data for the preceding year on the industries included under the classification chemicals and allied products—namely, coal tar and its products; acids, alkalis, salts and compressed gases; explosives, ammunition, fireworks and matches; fertilizers; medicinal and pharmaceutical preparations; paints, pigments and varnishes; soaps, washing compounds and toilet preparations; wood distillates and extracts, and a number of other related industries, such as the manufacture of baking powders, artificial abrasives, adhesives, flavoring extracts, insecticides, polishes and sweeping compounds.

The number of plants, the capital invested, employees by months, salaries and wages paid, cost of materials and fuel used and details regarding power equipment are all included, together with statistics of commodities produced. An added feature this year is the inclusion of a list of firms, giving the names, addresses and location of the plants for which the statistics of production are given.

Exposition of Inventions Will Be Held by American Institute

Manufacturers of chemical equipment, supplies, accessories, etc., and of chemicals proper, particularly those whose activities touch on the fertile field of inventions, will be interested in the Exposition of Inventions to be held, December 8 to 13 inclusive, in the Engineering Societies Building, New York City. The American Institute of the City of New York is handling this display through its Inventors' Section, with behind it an experience of ninety-six years in fostering and portraying American industrial life. A feature of the Exposition will be exhibits from the leading American industries showing the recent developments of various machines, utilities and processing methods.

Calendar

AMERICAN CERAMIC SOCIETY, summer meeting and tour, July 21 to Aug. 18.

AMERICAN ELECTROCHEMICAL SOCIETY, Detroit, Oct. 2 to 4.

AMERICAN ENGINEERING STANDARDS COMMITTEE, executive meeting, New York, July 12.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, Denver, Colo., July 15 to 18.

AMERICAN SOCIETY FOR TESTING MATERIALS, Atlantic City, June 23 to 28.

AMERICAN SOCIETY FOR STEEL TREATING, Boston, Sept. 22 to 26.

INSECTICIDE AND DISINFECTANT MANUFACTURERS ASSOCIATION, Montreal, Canada, June 30 to July 1.

NATIONAL SAFETY COUNCIL, thirteenth annual congress, Louisville, Ky., Sept. 29 to Oct. 3.

SOCIETY FOR PROMOTION OF ENGINEERING EDUCATION, Boulder, Colo., June 25 to 26.

WORLD POWER CONFERENCE, London, June 30 to July 12.

Trade Notes

A. S. Barada, of the Kansas City heavy chemical house of Barada & Page, will leave this week for a vacation in Europe.

The Standard Oil Co. of Indiana, Indianapolis, has arranged to give life insurance policies to all employees, totaling about 25,000 in twelve mid-Western states. The minimum death benefit covered by the policies will be \$500, advancing to \$2,000 after 10 years of continuous service with the company. The only requirement for procuring of policy is that the employee shall have been connected with the company for at least 1 year. All premiums will be handled by the company.

A business change of considerable proportions in connection with the Canada Malt Products Co., of Guelph, Ont., recently burned out, has been announced whereby the Canadian Dia Malt Co., a subsidiary of the Canadian Fleischmann Co., has purchased the assets, trademarks and good will of the Canada Malt Products Co. The Canadian Dia Malt Co. announces the construction of a larger structure on the site of the burned buildings.

The Paint, Oil & Varnish Club of New York will hold an outing on June 24, at the summer home of the Crescent Athletic Club, Bay Ridge, N. Y. Through the courtesy of the American Linseed Co., the steamer "Guy G. Major" will transport the members and guests to the club grounds.

J. C. Wilson, for several years identified with the vegetable oil business in New York, has moved to the Pacific coast, with headquarters at San Francisco.

The Gold Seal Chemical Corporation of Manhattan has increased its capital stock from \$70,000 to \$100,000.

Fred Jesser has withdrawn from the National Rubber Co., of Philadelphia, and the latter concern will be continued by Norman E. Humphreys.

William F. Eissing has opened an office at 52 Vanderbilt Ave., New York City. He will deal in industrial and fine chemicals.

Canadian Pulpwood Commission Not Ready to Report

Advices from Canada state that the report of the Royal Commission on Pulpwood will not be submitted at the present session of Parliament. It is reported that the commissioners have found difficulty in collaborating and digesting the large amount of data collected in various parts of the country. Hence unofficial advices are to the effect that a decision has not been reached by all the members of the commission. Opinion now inclines to the belief that the report will not be submitted for some months.

Men You Should Know About

HAROLD C. CLIFFORD, a chemist, is in the St. Francis Hospital, San Francisco, Calif., as a result of injuries sustained through the explosion of a paint vat at the local plant of the Hill-Hubbard Co. on June 4. He was severely burned about the body and received internal injuries. Mr. Clifford is 30 years of age.

HERBERT HENRY DODDS, recipient of a Master's degree during the present school year at the Audubon Sugar School, Louisiana State University, is now at Natal, South Africa, where he is engaged in installing a modern sugar experiment station. He took his B.S. in chemistry and agronomy in 1905, and his M.S. in 1907, at the University of Manchester, England.

A. C. FIELDNER, superintendent of the Pittsburgh Experiment Station, will represent the Bureau of Mines at the World Power Conference in London. He sailed June 19, and while abroad will make a thorough study of foreign progress in mining and fuel research.

MOMOSUKE FUKUSAWA, a prominent Japanese engineer, received the honorary degree of Doctor of Science at Union College, Schenectady, N. Y., on June 9.

FRANCIS P. GARVAN, president of the Chemical Foundation, New York, sailed recently for Europe for a vacation trip, accompanied by his wife and family.

JOH. HÄRDÉN, of the Metallographic Institute, Stockholm, arrived in New York on June 16. He expects to visit industrial and scientific centers before leaving for England about the middle of July.

ELMER T. HOWSON, Western editor of *Railway Age* and president of the National Conference of Business Paper Editors, has been installed as president of the Western Society of Engineers.

JOHN B. KLUMPP, president of the American Gas Association, has been elected a vice-president of the United Gas Improvement Co., Philadelphia, with which organization he has been connected for the past 30 years.

J. C. MCLENNAN, of the University of Toronto, has been elected president of the Royal Society of Canada.

J. A. MOFFETT, JR., has been elected vice-president of the Standard Oil Co. of New Jersey, succeeding Frederick David Asche, deceased. He entered the employ of the organization in 1906, and has been a member of the board of directors for some time past.

G. H. PRIEST, JR., of Fitchburg, Mass., heretofore connected with the Carpenter-Morton Co., of Boston, Mass., is now acting as paint expert in the Chemical Division of the Department of Commerce, Washington, D. C.

M. W. RANDALL has resigned as secretary of the Air Reduction Co., Cleveland, but will retain the office of vice-president. He will go to California

at an early date to assume his duties as treasurer of the California Cyanide Co., a subsidiary of the Air Reduction Co. R. B. DAVIDSON has been appointed secretary to succeed Mr. Randall and T. G. HARRISON has been named as assistant secretary.

D. M. STRICKLAND, of the American Rolling Mill Co., addressed the Washington chapter of the American Society for Steel Treating, June 13, on the subject "Manufacture, Properties and Applications of Armeo Ingot Iron Sheets."

M. L. SUDSBERRY, chief chemist for the Kansas State Grain Inspection Department, has resigned and will install a testing laboratory for the Kansas Co-operative Grain Growers Association at Leavenworth, Kan.

CUTHBERT S. TROTTER has been appointed general manager of Standard Clay Products, Ltd., succeeding his father, Major W. C. Trotter, of St. Johns, N. B., who continues as president and managing director of the company, although not actively engaged as general manager.

The honorary degree of Doctor of Science was conferred on **EDWARD RAY WEIDLEIN**, director of the Mellon Institute of Industrial Research of the University of Pittsburgh, at the sixty-eighth annual commencement of Tufts College, held on June 16 at Medford, Mass.

At the annual convention of the Flavoring Extract Manufacturers Association, Boston, Mass., June 13, F. F. ROGERS of Middletown, N. Y., was elected president for the ensuing year, succeeding Gordon M. Day. R. H. BOND was re-elected first vice-president; T. R. CARMEN and A. H. GUNNING were elected second and third vice-presidents, respectively. R. E. ATKINS of Cincinnati, Ohio, was elected treasurer.

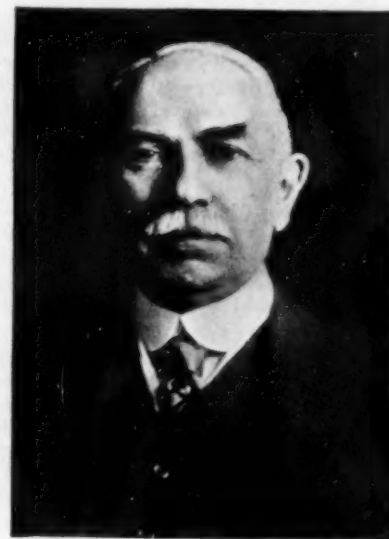
Obituary

H. M. SWETLAND, president of the United Publishers Corporation, which publishes *Iron Age*, *Dry Goods Economist*, *Automotive Industries* and other important business publications, died at his home in Upper Montclair, N. J., on June 15. He was one of the pioneers of modern industrial publishing and had been a leader in raising journalistic standards through his activities in the Associated Business Papers. At one time he was owner of *Power* and of *Engineering & Mining Journal* (as it was then called), both now owned by the McGraw-Hill Co.

Mr. Swetland was born in Chautauque County, New York, in 1853. In 1880 he came to New York as reporter and as subscription and advertising salesman of the *Boston Journal of Commerce*. In 1884 he became Boston representative of *Power*, later coming to New York and assuming the management of that publication. In

this capacity he was associated with James H. McGraw, now president of the McGraw-Hill Co., and Emerson P. Harris. The association was discontinued in 1888, when Mr. Swetland purchased *Power*, the ownership of which he retained until he sold it to the late John A. Hill in 1900.

For many years thereafter Mr. Swetland gave his chief attention to the publication of the magazines serving the automotive industry. In 1911 he



H. M. Swetland

organized the United Publishers Corporation, which brought together publications in the steel, automotive, building and textile fields. He was elected president of that corporation and retained that office to the time of his death. He was also president of the National Publishers Association, the *Class Journal Co.*, the *Federal Printing Co.*, the *U. P. C. Realty Co.* and the *Swetland Realty Co.*, and a director of the *Commercial Trust Co.*

Mr. Swetland's work and contribution to industrial publishing are well set forth in the following tribute paid to him by his lifelong friend and former associate, Mr. McGraw:

"Mr. Swetland's success as a man and a publisher was due to a rare combination of personal qualities and business acumen. He was a tireless worker, had great penetration, concentration and perseverance. He was an organizer of the first rank, and was always a co-operator. His ideals in publishing were high, service to the readers of his publications being his first consideration. The publishing business has lost an outstanding figure in the passing of Horace M. Swetland, but his work will endure in the great institutions to which he gave unstinted devotion, and in the lives of those whom he trained in the technique of publishing and encouraged to make the best of their opportunities."

Mr. Swetland not alone won for himself marked distinction in American technical journalism and in those industries which his papers served, but—what he prized more—the high regard and respect of all his very wide circle of associates, business and social. To these his passing brings a keen regret.

Market Conditions

Reduced Selling Prices for Lead Pigments Feature Trading

Quiet Week Generally Reported for Chemical Products— Smaller Production Steadies Coal-Tar Crudes

IN THE preceding week, material declines in price were announced for lead oxides and in the past week this was followed by lower quotations for basic carbonate of lead and sulphate of lead. While these price changes followed legitimately the easier selling level for the metal, they call attention to the decline in consuming demand as compared with the corresponding period of last year.

Another feature of the present market is found in the firm position of some of the coal-tar crudes. This arises as a result of curtailment on the part of producers. Coincidentally comes a report from Washington stating that production of coal-tar products in 1923 reached record proportions, even surpassing the large output which had been necessary to satisfy consuming needs in 1920.

There is still no decided price tendency in the chemical list and the buying movement is not large enough to justify a firmer feeling. The weighted index number for the week, however, was considerably higher. This was due to the influence of allied products which have commanded higher prices.

A better feeling has permeated the soap trade and price-cutting competition which had recently been in evidence has been eliminated. Improvement in this trade also has been tangibly expressed in a larger buying movement of oils and fats. This is regarded as a forerunner of a more active call for soap-making chemicals. Most of the other manufacturing industries have not improved to such an extent that any gain in call for raw materials is probable.

Interest in arsenic and calcium arsenate is spasmodic and the amount of stocks on hand prevents any real firmness to values. Reports from the cotton-growing states say the boll weevils are more numerous than at this time last year but in most sections damage has been small because the plant is too young for their attack. In a short time the situation should clarify itself and a fairly accurate estimate be possible of the probable consumption of arsenate. In the meantime the arsenic market shows symptoms of an advance, as foreign markets have advanced, and a broadening in demand undoubtedly would have an immediate effect on values in our market.

Acids

Sellers are complaining of the relatively slow demand for citric and tartaric acids. The soft drink industry has not been taking normal amounts.

Unseasonable weather is held accountable for this falling off in consumption. Prices for these acids have shown but little change recently, with tartaric quoted at 27½c. per lb. and citric at 47@49c. per lb., according to grade and seller. Oxalic acid sold as high as 11c. per lb. last week, in small lots. There is a difference in price according to seller and on round lots competition

Lead Carbonate and Sulphate Decline — Domestic Arsenic Sold at Lower Levels—Copper Sulphate Easy—Bichromates Firmer—Sal Ammoniac Unsettled—Prussiate of Potash Steady—Citric and Tartaric Acids in Light Demand

is keen, although some domestic producers are not pressing sales and appear to prefer to sell in a small way and thus secure higher prices. The mineral acids are still in a quiet period and values promise to be irregular until accumulations have been worked off. Nitric acid has been the firmest of this group but values for nitrate of soda for forward deliveries are lower than for nearer positions and this promises lower production costs for the acid.

Potashes

Bichromate of Potash—A firmer feeling has been noted for this material. The lowest price openly quoted is 9½c. per lb. and on moderate sized lots, this figure seems to be maintained. On round lots for nearby delivery it is stated that 9½c. per lb. can still be done but it is difficult to secure a quotation at that level. Some sellers are reported to be carrying no surplus stocks, which adds to the firmness of the market.

Bicarbonate of Potash—Most reports agree that inquiry has been light and sellers have found it difficult to maintain values. Asking prices for spot goods ranged from 11c. to 12c. per lb.

Caustic Potash—Small lots sold at 6½c. per lb. on spot but interest was slow and the price tendency was downward. On round lots 6½c. per lb. could be done and the market was under some pressure with offerings well distributed among sellers.

Carbonate of Potash—There was an absence of buying in large lots and buyers were favored on the sales which went through. Asking prices were about the same as in recent weeks but it was stated that on firm offers these prices were being shaded. Hydrated

was reported to be offered at 5½c. per lb. and 80-85 per cent calcined also at 5½c. per lb.

Chlorate of Potash—Domestic producers have continued to ask a premium for their goods and the fact that imported offerings have been small has given a firm tone to prices. Buying interest is not keen but the market is free from selling pressure and the lowest price heard is 7c. per lb. for spot and shipments.

Pernanganate of Potash—This material has drifted along with nothing new in the market. In some quarters it was said that inquiry had been too small to test prices. The general quotation for imported material on spot is 14c. per lb.

Prussiate of Potash—Red prussiate is in a stronger position and while buying is reported to be quiet, the lowest price heard was 37½c. per lb. and the price ranged up to 42c. per lb., according to seller. Yellow prussiate has held up to former quotations of 18½@19c. per lb. for spot material and shipments from abroad are fractionally lower than the spot price.

Sodas

Acetate of Soda—In spite of the fact that some sellers are not offering, the market remains dull and easy. Large lots are not attracting attention and only an irregular call is reported for small amounts. Asking prices are on a basis of 4½@5c. per lb., according to quantity.

Bichromate of Soda—The market apparently has come under more restricted control, as some factors are working on small stocks. Very little improvement in buying is noted but competition is less keen and asking prices are 7½@7¾c. per lb. Contract withdrawals are not heavy and large consuming trades are not in need of additional lots.

Caustic Soda—Details of experts in April show that Mexico took 1,923,994 lb., Argentina 1,516,376 lb., Brazil 969,643 lb., Philippines 733,395 lb., Japan 710,577 lb., Cuba 701,674 lb., Canada 431,954 lb., and Spain 224,000 lb. Exports to other countries were very small. Present buying for export is described as moderate. The prices quoted still show a range and 2.90@3.05c. per lb. f.a.s. represents the range according to seller. The movement to domestic consumers on old contracts is fairly good with new business light. Spot and prompt from works are quoted at 3.20c. per lb. in carlots and the contract figure holds at 3.10c. per lb.

Cyanide of Soda—Imports have been heavy, reaching a total of 24,433,247 lb. for the 10 months ended April 30, as compared with 15,548,365 lb. for the corresponding period of the preceding year. Most of the imported material

is said to be of lower grade than the domestic product and is non-competitive. Fair call is reported for domestic grades with prices at 20@22c. per lb.

Fluoride of Soda—About the only feature to fluoride consists in the willingness of sellers to meet buyers' views and prices are reported as easy accordingly. Arrivals from foreign markets have not been large but spot supplies are fairly large and material can be purchased below 9c. per lb.

Nitrate of Soda—Offerings for prompt delivery are limited and this holds the spot quotation at a premium over later positions. Demand has been slow in both Northern and Southern points. Spot material is quoted at \$2.60@2.65 per 100 lb. Later deliveries are offered at \$2.35 per 100 lb. Some uncertainty is still felt about the probable effect of recent decrees in Chile with respect to the American trade but there seems to be little doubt about the refusal to sell further nitrate lands to American producers.

Nitrite of Soda—Considerable interest is shown in this material. In the first place it is believed that consumption in this country will be materially increased. With some large contracts to expire in the near future there is speculation regarding the ability of domestic producers to compete for this business or at least there is uncertainty about the attitude of importers. If current values are maintained it is thought that the domestic output will be increased. In the spot market asking prices range from 8½c. to 8¾c. per lb. and shipments from abroad are quoted above the spot levels.

Prussiate of Soda—Conditions have undergone no change during the week. Domestic producers are dealing direct with consumers with prices quoted at 10@10½c. per lb. Interest in imported prussiate is dull and prices are 9¾@10c. per lb.

Miscellaneous Chemicals

Arsenic—There were sales of round lots of domestic arsenic early in the week at 8½c. per lb. and later on carlots changed hands at 8c. per lb. The closing quotation was 8@8½c. per lb. Arrivals of arsenic continue from foreign markets but holders of spot goods are not so eager to push sales and the tone was decidedly firmer as the week advanced. There is a tendency to await developments in the cotton fields where boll weevils are reported to be numerous. The market also strengthened by advices that foreign markets were higher. Cables from Europe quoted shipments at 8½c. per lb. and Japan cabled prices as high as 9½c. per lb.

Bleaching Powder—It is admitted that producers are carrying surplus stocks and that new business is coming to hand in a desultory way. Offerings, however, are not large enough to weaken the market and the steady position of the market, as far as first hands are concerned, is the outstanding feature of the market. The quotation remains at 1.90c. per lb. for large drums, carlots, at works.

Barium Products—Importations have been larger and this has eased the situation on foreign goods. Domestic

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	154.34
Last week	152.79
June, 1923	177.00
June, 1922	157.00
June, 1921	147.00
June, 1920	274.00
June, 1919	229.00
June, 1918	272.00

The advance of 155 points in the week's index number reflects another uplift in the market for crude cottonseed oil.

producers were not free sellers, and, according to reports, they are sold up on both carbonate and chloride. Imported carbonate settled at \$60@62 per ton, with chloride at \$80@82 per ton. Barium nitrate, in casks, held at 8¼@8½c. per lb.

Copper Sulphate—Competition for business is keen and with no change in the position of the metal the undertone of the market continues rather easy. Domestic producers offered material for prompt shipment at prices ranging from 4.40@4.60c. per lb., carload basis. Imported sulphate was available for

prompt shipment from the other side at 4½c., with intimation that this figure could be duplicated on spot transactions.

Formaldehyde—First hands continue to quote 9½c. per lb., carload basis, but the market was barely steady. Again small lots sold for immediate delivery at 9½c. per lb., and it was reported that carload business might go through at concessions.

Sal Ammoniac—Some selling pressure was reported in imported material on spot and the market settled nominally at 6¼@6½c. per lb. On domestic the market was notably unchanged.

Alcohol

With no accumulation in supplies the market for denatured alcohol continues on a fairly steady trading basis. Deliveries against existing contracts are absorbing most of the output. First hands quote prices unchanged on the basis of 45½c. per gal. for the formula No. 1, special, in drums, carload lots.

Methanol was notably unchanged, with the undertone easy. Producers quote 75c. per gal. on the 95 per cent grade, in drums, carload basis.

Coal-Tar Products

Benzene Holdings Below Normal and Market Firm—Cresylic Acid Lower—Pyridine Easier—Naphthalene Unsettled . . .

WITH production of byproduct coke reduced by almost 50 per cent from the peak the output of crudes is easily taken care of by the current rate of consumption. Unfavorable developments in the petroleum situation had little or no influence upon the market for benzene. Stocks of the latter are subnormal and most distributors regard the tone of the market as firm. The fact that exports of benzene have fallen off sharply attracted no attention, the slump in foreign shipments being attributed to the steady gain in domestic consumption of the coal-tar product in the motor fuel field. In other words, producers had no surplus for export. Cresylic acid closed slightly lower on increased offerings on the part of domestic producers. Pyridine was available at concessions. There was no change in the position of phenol. Naphthalene, especially white flakes, was offered in a large way and prices were unsettled in nearly all quarters. Advices from Washington say that the final census report on coal-tar dyes for 1923 will show production of 93,669,000 lb., or more than 1,500,000 lb. greater than the preliminary report indicated.

Aniline Oil and Salt—Exports for the 10 months ended April 30 amounted to 183,914 lb., valued at \$52,104, which compares with 381,969 lb., valued at \$69,354, for the corresponding period a year ago. Aniline oil was notably unchanged at 16@16½c. per lb. The salt held at 22@23c. per lb.

Benzene—A firm undertone prevailed all week in the market for benzene, but producers announced no change in

the trading basis. With stocks small, due to the slump in production, traders expect prices to hold even should demand fall off considerably. First hands quote 23c. per gal. on the 90 per cent grade and 25c. per gal. on the pure, tank cars, f.o.b. works.

Cresylic Acid—Offerings increased and lower prices were named in several quarters. Demand in the past month or so has not come up to expectations. There were sellers of the 97 per cent pale at 63@68c. per gal., with the 95 per cent at 58@61c. per gal. During the week 206 drums of coal-tar distillate arrived here from Liverpool.

Naphthalene—The market was a little more active on white flakes, but supplies were pressing for sale at all times and prices were extremely irregular, with the tendency favoring buyers. White flake for immediate delivery was nominal at the close at 5@5½c. per lb. The call for chips was slow and quotations of 4½@4¾c. for white goods were barely steady. Crude to import held at 2@2½c. per lb., c.i.f. New York.

Phenol—Small lots of U.S.P. phenol sold on spot at 27½c. per lb., with offerings at this price up to the close. The fact that at least one producer stood ready to take on business at 26c. per lb., nearby delivery, made some traders a little more anxious to sell spot goods.

Pyridine—Trading was inactive and with offerings from abroad larger the market again eased off, spot material closing at \$4.35@4.65 per gal. On futures \$4 could have been done.

Vegetable Oils and Fats

Cottonseed Higher on Good Demand—July Linseed Advances— Active Trading in Coconut and China Wood Oils

INQUIRY for vegetable oils and animal fats was good. Refiners supported the market for cottonseed oil and the tendency of prices was upward. Improvement in prices for grains and provisions also helped matters in the trade for edible oils. Reports to the effect that soap makers experienced a better call for finished products strengthened sellers' views on greases and tallow. Coconut oil sold at unchanged prices, but the market was quite firm. Speculative activity in china wood oil resulted in a rather wide range of prices for this material. Menhaden oil, crude, was lower.

Cottonseed Oil—Interest centered in the monthly statement on cottonseed products issued by the Bureau of the Census, indicating that distribution of oil during the month of May amounted to 179,000 bbl., which compares with 187,500 bbl. in April and 133,000 bbl. for May a year ago. The showing was considered excellent and strengthened the opinion that only an early movement of new crop oil could prevent a shortage in the supply this fall. The visible supply on May 31 was placed at 648,000 bbl., against 627,000 bbl. on the corresponding date a year ago. Offerings of crude were scanty all week and one refiner appeared anxious to accumulate stocks, sales passing at prices ranging from 8½@9c. per lb., tank cars, f.o.b. mills, which compares with 8½c. per lb. paid a week ago. On Wednesday prime summer yellow oil in the New York market, July option, closed at 10.60c. bid, but liquidation on Thursday by Southern longs brought on a reaction of 18 points. Spot prime summer yellow closed at 10.60c. bid and 11.50c. asked. There was a little selling of the distant positions on more favorable cotton crop news. Bleachable oil was in demand but scarce, bids at 9½c. per lb., tank cars, f.o.b. Texas common points, bringing out no sellers. Lard compound was advanced to 12c. per lb., in bbl., carload lots, f.o.b. New York. Cash demand for oil was good, while the call for compound was fair. Pure lard was firmer on the strength in grains and some export business. Cash lard in Chicago settled at 10.62c. per lb. Stocks of lard in the Chicago district on June 15 amounted to 82,265,280 lb., which compares with 71,255,332 lb. on June 1 and 37,627,350 lb. on June 15 a year ago.

Linseed Oil—Higher seed markets and rather limited stocks of oil served to strengthen prices in all directions. Early in the week July oil sold at 90@91c. per gal., in bbl., carload lots, but later all crushers raised their selling views to 94c. per gal. establishing July oil on a parity with the spot quotation. Several crushers demanded 94c. on August-September deliveries, but in the absence of buying interest in futures the price was considered wholly nominal. July flaxseed at Duluth closed on Thursday at \$2.41½ per bu., which compares with \$2.35½ a week ago. Demand for seed was good, while

offerings were small. The new crop is progressing favorably, according to official information. Buenos Aires quoted July seed in the option market at \$1.76 per bu. The firmer seed markets followed closely upon the publication of another reduction in the official estimate on production in the Argentine for the 1923-24 crop. The final estimate on production in the Argentine places the yield at 59,500,000 bu., which compares with 64,256,000 bu., the second preliminary estimate, and 77,200,000 bu., the first preliminary. Traders as a whole did not take the outside figures on production seriously and even now many believe that the total crop may not exceed 55,000,000

Consumption of Cottonseed Oil in May 179,000 Bbl.

An analysis of the report on cottonseed products, issued by the Bureau of the Census on June 19, indicates consumption of oil for the month of May of 179,000 bbl., which compares with 187,500 bbl. in April and 133,000 bbl. for May a year ago.

Cottonseed statistics for the 10 months ended May 31, with a comparison, follow:

	August-May	
	1923-24	1922-23
Seed received, ton....	3,287,044	3,208,033
Seed crushed, ton.....	3,226,257	3,192,895
Crude oil mfd., lb.....	954,434,390	982,773,859
Ref'd oil mfd., lb.....	797,691,367	874,255,102
Stocks May 31:		
Seed, ton.....	66,127	23,675
Crude oil, lb.....	52,333,249	23,714,206
Ref'd oil, lb.....	194,458,331	222,827,794
Exports, 10 months:		
Crude oil, lb.....	22,910,343	25,450,262
Refined oil, lb.....	13,309,871	35,521,172
Cake and meal, tons	110,549	215,954

bu. Exports of flaxseed from the Argentine from Jan. 1 to June 13 amounted to 36,470,000 bu., which compares with 33,248,000 bu. for the corresponding period a year ago.

China Wood Oil—Forced selling took place early in the week, sending the quotation for tank cars in the Pacific coast markets down to 10½@10¾c. per lb. Later shorts tried to cover and bids were raised to 11c. per lb. Demand for wood oil has been disappointing and, according to importers, most of the recent activity has been speculative in character.

Coconut Oil—Several bulk lots of Ceylon type oil sold for shipment from Manila at 7½@7¾c. per lb., c.i.f. Pacific coast ports, with bids in the market at the top figure toward the close. Ceylon type oil for future delivery in sellers' tank cars sold at 7½c. per lb., with 7½c. asked on remainder of year business, f.o.b. coast, late in the week. In New York spot oil settled at 8½c. asked, sellers' tank cars.

Corn Oil—Crude oil was advanced to 8½@9c. per lb., tank cars, f.o.b. point of production, June-July shipment. The market was firm in sympathy with crude cottonseed oil.

Palm Oils—Inquiry was around for nearby material. Foreign markets were slightly higher. Lagos for shipment settled at 7½@7¾c. per lb., with Niger at 6¾c. per lb.

Menhaden Oil—Fishing is now under way all along the Atlantic coast, but returns have not been favorable. Producers of crude oil were more anxious for business and offerings came out at 40c. per gal., "if made" basis, tank cars, factory. Demand was quiet.

Tallow—Some "outside" lots of tallow equal to extra special in quality sold at 7c. per lb., f.o.b. plant, an advance of ½c. Choice white grease was advanced to 8½@9c. per lb. Yellow grease was firmer, closing at 6½@6¾c. per lb. Oleo stearine sold at 10c. per lb., an advance of ½c.

Miscellaneous Materials

Antimony—Inquiry has improved and with primary markets higher than here the undertone steadied. Chinese and Japanese held at 8½@8¾c. per lb., with Cookson's "C" grade 12½c. per lb. Chinese needle, lump, nominal at 8½@9c. per lb.

Glycerine—There was fair call for dynamite glycerine and the market was steady at 15½@16c. per lb., drums included, carload lots, f.o.b. point of production. Chemically pure was nominally unchanged at 16½@16¾c. per lb. Offerings of soap lye crude, basis 80 per cent, were made at 10½c. per lb., loose, carload lots, f.o.b. point of production. Saponification crude, basis 88 per cent, nominal at 11½c. per lb., loose.

Naval Stores—There was no important change in the situation. Offerings were large enough to unsettle the market, spirits of turpentine closing at 83@84c. per gal. Low-grade rosins held at \$5.55@\$5.65 per bbl.

Shellac—Makers of talking machine records have not been taking usual quantities and this tends to offset other trade factors. T. N. was available on spot at 53@54c. per lb., and prices were barely steady.

Quicksilver—Lower prices in London caused prices to ease here and sellers now quote \$73@\$74 per flask of 75 lb., a decline of \$1 for the week and \$5 from the recent high.

Lead Pigments—Leading producers announced a reduction on June 19 in prices for carbonate and sulphate of lead, the decline amounting to ½c. per lb. This establishes the market for standard dry white lead at 9¾c. per lb., and the sublimed at 9½c. per lb. Dry red lead, in casks or bbl., held at 10½c., this commodity showing no further change from the sharp decline announced on June 10. The decline was attributed to lower costs for pig lead and slackened demand. Pig lead closed steady at 7c. per lb., New York.

Zinc Oxide—There has been no material change in the zinc situation, and this is reflected in a rather steady market for zinc oxide, leading producers maintaining the selling schedule for American process, lead free, at 7½c. per lb., carload basis. French process, red seal, was nominally unchanged at 9½c. per lb. Demand from rubber tire manufacturers has fallen off.

Imports at the Port of New York

June 13 to June 19

ACIDS—Cresylic—6 dr., Liverpool, Monsanto Chemical Works. Phenol—20 dr., Antwerp, Lunham & Reeve; 3 kg., Liverpool, Monsanto Chem. Wks. Stearic—20 cs., Rotterdam, M. W. Parsons & Plymouth Organic Lab.; 62 bg., Rotterdam, Ponds Extract Co.

ALUMINA SULPHATE—30 csk., Hamburg, Order; 3 cs., Marseilles, Monmouth Chemical Corp.

AMMONIUM CARBONATE—15 csk., Liverpool, Order.

ANTIMONY REGULUS—500 cs., Hankow, C. Hardy, Inc.; 500 cs., Hankow, F. A. Cundill; 500 cs., Changsha, Irving Bank-Col. Trust Co.; 320 cs., Changsha, National Union Bank; 500 cs., Hankow, C. Hardy, Inc.; 500 cs., Hankow, F. A. Cundill & Co.

ARSENIC—400 cs., Changsha, C. Gitlan; 500 cs. (at San Francisco), Kobe, Toba Maru, Order; 300 cs., Kobe, Hole Co.; 200 cs., Kobe, Frazer & Co.; 300 cs., Kobe, Mitsui & Co.; 150 cs., Kobe, Suzuki & Co.

ASBESTOS—529 bg., London, Asbestos, Ltd.

BARIUM BINOXIDE—149 cylinders, Havre, Luskin & Co.

BARIUM CHLORIDE—65 csk., Antwerp, R. W. Greeff & Co.; 132 csk., Antwerp, E. M. Sergeant Co.

BORAX—242 bg., Valparaiso, Order.

BRONZE POWDER—11 cs., Bremen, B. F. Drakenfeld & Co.; 19 cs., Bremen, Uhlfelder & Co.

CASEIN—332 bg., Buenos Aires, Bank of the Americas; 375 bg., Buenos Aires, Order; 20 bg., Liverpool, American Express Co.

CAMPOR—200 cs. refined, Kobe, H. J. Baker & Bros.; 300 cs., Kobe, Stallman & Co.; 75 cs., Kobe, Mitsui & Co.; 200 cs., Kobe, Suzuki & Co.; 505 cs. crude, Shanghai, Order.

CHALK—800,000 kilos, Dunkirk, J. W. Higman Co.; 500 tons (in bulk), London, Baring Bros & Co.

CHEMICALS—98 csk., London, Toch Bros., Inc.; 3 cs., London, Order.

COAL-TAR DISTILLATE—30 dr., Liverpool, Monsanto Chemical Works; 170 dr., Liverpool, Order.

COLORS—15 csk., Havre, S. L. Libby Corp.; 6 cs., Havre, B. F. Drakenfeld & Co.; 3 cs., Havre, Devos & Reynolds Co.; 2 bbl. aniline, Havre, Carbic Color & Chemical Co.; 42 csk. aniline, Havre, Ciba Co.; 14 csk. aniline, Havre, Sandoz Chemical Works; 3 csk. do., Havre, Order; 4 csk. do., Rotterdam, Bank of the Manhattan Co.; 11 csk. do., Rotterdam, Garfield Aniline Works, Inc.; 3 pkg. do., Rotterdam, H. A. Metz & Co.; 3 csk. do., Rotterdam, Color Service Corp.; 2 cs. aniline, Rotterdam, E. S. Chapin; 12 bbl., Havre, Wallerstein Lab.

CHROME ORE—1,000 tons, Delagoa Bay, E. J. Lavino Co.

CORUNDUM ORE—675 bg., Delagoa Bay, Standard Bank of South America.

DIVI-DIVI—152 bg. powdered, Order.

EPSOM SALT—200 bbl., Hamburg, Brown Bros. & Co.

FULLERS EARTH—800 bg., London, L. A. Salomon & Bros.

GAMBIER—160 cs., Singapore, Order; 425 cs., Asahan, Order.

GLYCERINE—10 csk., Bordeaux, Marx & Rawolle.

GRAPHITE—750 bbl. Kobe, Mitsui & Co.

GUMS—100 bg. copal, Antwerp, Equitable Trust Co.; 129 bg. damar, 100 cs. copal and 140 bg. do., Singapore, Baring Bros. & Co.; 25 cs. copal, Singapore, Brown Bros. & Co.; 271 cs. damar, Singapore, American Exchange National Bank; 200 cs. damar, and 50 cs. copal, Singapore, Chemical National Bank; 192 bg. copal, Singapore, Guaranty Trust Co.; 256 bg. damar and 64 bg. copal, Singapore, Order; 70 bg. copal, Singapore, Order; 2,030 bg. arabic, Port Sudan, Order; 155 bg. and 5 cs. kauri, Auckland, Order; 100 cs. damar, Batavia, Chemical National Bank; 100 cs. do., Batavia, National City Bank; 100 cs. do., Batavia, W. Schall & Co.; 50 cs. do., Batavia, American Exchange National Bank; 100 cs. do., Batavia, Order; 400 cs. do., Batavia, Order; 448

pkg. copal, Macassar, Irving Bank-Col. Trust Co.; 398 pkg. do., Macassar, Equitable Trust Co.; 132 pkg. do., Macassar, Kidder, Peabody Acceptance Corp.; 2,194 pkg. do., Macassar, Order; 703 bg. yacca, Adelaide, Order; 2,853 bg. kauri, Auckland, Order.

IRON OXIDE—20 csk., Liverpool, J. A. McNulty; 12 csk., Liverpool, Order; 29 csk., Liverpool, Reichard-Coulston, Inc.; 248 bbl., Malaga, C. J. Osborn & Co.; 114 bbl., Malaga, American Exchange National Bank; 100 bbl., Malaga, Scott L. Libby

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

CHEMICALS, heavy. Florence, Italy. Purchase.—10,550.

CHEMICALS, heavy and fine, ethereal oils, and menthol. Vienna, Austria. Agency.—10,553.

CHLORINE, liquid, in steel cylinders. Johannesburg, South Africa. Purchase.—10,552.

LACQUER and thinners for varnishing brass articles. Tiel, Netherlands. Purchase.—10,549.

ROSIN. Bahia, Brazil. Agency.—10,548.

ROSIN. Bahia, Brazil. Agency.—10,579.

CAUSTIC SODA. Bahia, Brazil. Agency.—10,548.

VARNISHES. Budapest, Hungary. Exclusive agency.—10,576.

Corp.; 100 bbl., Malaga, Reichard-Coulston, Inc.; 80 bbl., Malaga, J. Lee Smith & Co.; 59 bbl., Malaga, Order.

IRON SILICATE—3 csk., Liverpool, A. Murphy & Co.

LAMPBLACK—30 bbl., Rotterdam, A. Hurst & Co.

LITHOPONE—60 csk., Antwerp, A. Klipstein & Co.

LEAD NITRATE—11 csk., Liverpool, Order.

MAGNESIUM CHLORIDE—176 dr., Bremen, Brown Bros. & Co.; 76 dr., Bremen, Order.

MINERAL EARTH—100 csk., Hamburg, Order; 75 csk., Hamburg, J. M. Rappaport, Inc.

OSHER—134 bg., Calcutta, Order; 534 csk., Marseilles, Reichard-Coulston, Inc.

OILS—Cod—59 csk., St. Johns, National Oil Products Co.; 10 csk., St. Johns, Nieder & Co.

China Wood—6 bbl., Hankow, Order; 305 csk., Hankow, Schultz & Ruckgaber; 254 csk., Hankow, National City Bank; 420 bbl., Hankow, Mitsui & Co.

Cocunut—705 tons (in bulk), Manila, Order; 785 tons (in bulk), Manila, Philippine Refining Co.; 1,154 tons (in bulk), Manila, Procter & Gamble Co.

Olive Oil Fats (sulphur oil)—300 bbl., Messina, Order; 100 bbl., Piraeus. **Palm**—622 csk., Hamburg, African & Eastern Trading Co.

Perilla—200 bbl. Dairen, W. T. Smith & Co.; 600 bbl., Dairen, Cook & Swan Co.; 132 bbl., Dairen, Balfour, Williamson & Co.; 200 bbl., Kobe, Mitsui & Co.

Rapeseed—50 bbl., London, W. B. Dick & Co. Seal—294 tons and 60 csk., St. Johns, Cook & Swan Co. **Whale**—25,743 bbl., Rio de Janeiro, Order.

OIL SEEDS—Linseed—3,995 bg., Buenos Aires, L. Dreyfus & Co.; 25,463 bg., Buenos Aires, Order; 68,252 bg., Buenos Aires, Spencer Kellogg & Sons. **Peanuts**—1,120 bg. shelled, Hankow, Order.

PLUMBAGO—47 bbl., Colombo, Order.

POTASSIUM SALTS—100 csk. bicarbonate, Rotterdam, Mallinckrodt Chemical Works; 90 cs. salts, Hamburg, Potash Importing Corp. of America; 800 csk. chlorate, Hamburg, Seaboard National Bank; 5 cs. salts, Hamburg, Order; 30 bbl. hydrate and 26 bbl. salts, Hamburg, Brown Bros. & Co.; 500 bg. muriate, Bremen, Potash Importing Corp. of America.

PYRIDINE—6 dr., Antwerp, Order.

QUEBRACHO—5,484 bg., Buenos Aires, First National Bank of Boston; 3,070 bg., Buenos Aires, National Bank of Commerce; 32,063 bg., Buenos Aires, Tannin Corp.; 14,662 bg., Buenos Aires, Order.

SAL AMMONIAC—112 bbl., Rotterdam, Roessler & Hasslacher Chemical Co.

SHELLAC—31 cs., Rotterdam, C. F. Gerlach; 431 cs. sticklac, Bangkok, Order; 177 cs. do., Singapore, Bennett & Co.; 159 cs. do., Singapore, Bennett & Co.; 104 bg. garnet, Hamburg, Kasebler, Chatfield Shellac Co.; 200 bg., Calcutta, Mechanics & Metals Nat'l Bank; 250 bg., Calcutta British Bank of South America; 300 bg., Calcutta, National City Bank; 50 bg., Calcutta, J. Munroe & Co.; 590 bg., Calcutta, Order.

SIENNA—20 csk., Leghorn, Reichard-Coulston, Inc.; 20 bbl., Leghorn, Order.

SODIUM SALTS—10,752 bg. nitrate, Iquique, Wessel, Duval & Co.; 14,116 bg. do., Iquique, E. I. du Pont de Nemours & Co.; 8 csk. carbonate, Havre, P. C. Kuyper & Co.; 15 csk. prussiate, Rotterdam, Meteor Products Co.; 80 csk. carbonate, Rotterdam, Roessler & Hasslacher Chem. Co.; 100 csk., hyposulphite, Hamburg, Order; 224 dr. cyanide, Liverpool, Order; 19 csk. prussiate, Liverpool, Order; 356 cs. cyanide, Havre, Am. Hawaiian S.S. Co.; 13,450 bg. nitrate, Iquique, W. R. Grace & Co.; 25 csk. prussiate, Liverpool, Order.

SILVER SULPHIDE—43 bg., Antofagasta, H. P. Winter & Co.

STARCH—1,300 bg. potato, Rotterdam, Stein, Hall & Co.

SUMAC—350 bg., Palermo, R. Neumann Co.; 700 bg., Palermo, New York Trust Co.; 2,020 bg., Palermo, Order.

TALC—500 bg., Bordeaux, L. A. Salomon & Bros.; 100 bg., Bordeaux, L. H. Butcher & Co.; 400 bg., Bordeaux, Whittaker, Clark & Daniels; 1,600 bg., Bordeaux, L. A. Salomon & Bros.; 200 bg., Bordeaux, C. B. Chrystal & Co.; 300 bg., Genoa, Italian Discount & Trust Co.; 100 bg., Genoa, C. Mathieu.

TANNING EXTRACT—25 csk., Southampton, S. Saxe; 12 csk., London, S. Saxe.

TARTAR—138 bg., Bordeaux, Order; 27 csk., Naples, Tartar Chemical Works; 75 bg., Genoa, C. Huisking; 45 csk., Naples, Tartar Chemical Works; 42 bg., Valparaiso, Order; 105 bg., Marseilles, Order; 105 bg., Marseilles, C. Pfizer & Co.; 406 bg., Marseilles, Royal Baking Powder Co.

VANADIUM—2,600 bg., Callao, Vanadium Corp. of America.

WAXES—278 bg., Para, National City Bank; 230 bg., Para, Lazard Freres; 111 bg., Para, Order; 31 bg. beeswax, Valparaiso, Guaranty Trust Co.; 85 bg. do., Valparaiso, Duncan, Fox Co.; 36 cs. beeswax, Rotterdam, Order; 49 bg. ceresin, Hamburg, Order; 50 cs. beeswax, Hamburg, Brown Bros. & Co.; 15 bg. beeswax, Alexandria, Order; 54 bg. beeswax, Talcahuano, W. R. Grace & Co.; 276 bg. beeswax, Valparaiso, Order; 1,119 bg. paraffine, London, Order; 7,200 bg. paraffine, Balikpapan, Asiatic Petroleum Co.; 400 bg. paraffine, London, Order.

WHITING—916 bg. powdered, Dunkirk, Taintor Trading Co.; 300 bg., Havre, C. B. Chrystal Co.; 700 bg., Havre, Hamill & Gillespie.

WHITE LEAD—50 keg, London, J. Lee Smith & Co.

WITHERITE—235 bg., Newcastle, R. W. Greeff & Co.; 100 tons, Newcastle, Order.

WOOL GREASE—120 bbl., Antwerp, Order; 100 bbl., Bremen, Pfaltz & Bauer; 50 bbl., Bremen, Kidder, Peabody Acceptance Corp.; 30 bbl., Bremen, Order; 30 bbl., Liverpool, Order.

ZINC OXIDE—50 bbl., Antwerp, Philipp Bros.; 182 bbl., Barcelona, J. W. Eitwell & Co.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

General Chemicals

Acetone, drums, wks.	lb.	\$0.15 - \$0.15
Acetic anhydride, 85%, dr.	lb.	.38 - .38
Acetic, 28%, bbl.	100 lb.	3.12 - 3.37
Acetic, 56%, bbl.	100 lb.	5.85 - 6.10
Acetic, 80%, bbl.	100 lb.	8.19 - 8.44
Glacial, 99%, bbl.	100 lb.	11.01 - 11.51
Boric, bbl.	lb.	.09 - .09
Citric, kegs.	lb.	.47 - .48
Formic, 85%, dr.	lb.	.12 - .13
Gallie, tech.	lb.	.45 - .50
Hydrofluoric, 52%, carboys	lb.	.11 - .12
Laetic, 44%, tech., light, bbl.	lb.	.12 - .13
22% tech., light, bbl.	lb.	.06 - .06
Muriatic, 18% tanks	100 lb.	.80 - .85
Muriatic, 20% tanks	100 lb.	.95 - 1.00
Nitric, 36%, carboys	lb.	.04 - .04
Nitric, 42%, carboys	lb.	.04 - .05
Oleum, 20%, tanks	ton	16.00 - 17.00
Oxalic, crystals, bbl.	lb.	.09 - .10
Phosphoric, 50% carboys	lb.	.07 - .08
Pyrogallie, resublimed.	lb.	1.55 - 1.60
Sulphuric, 60% tanks	ton	9.00 - 10.00
Sulphuric, 60% drums	ton	13.00 - 14.00
Sulphuric, 66% tanks	ton	14.00 - 15.00
Sulphuric, 66% drums	ton	18.00 - 19.00
Tannic, U.S.P., bbl.	lb.	.65 - .70
Tannic, tech., bbl.	lb.	.45 - .50
Tartaric, imp., powd., bbl.	lb.	.27 - .28
Tartaric, domestic, bbl.	lb.	.30 - .30
Tungstic, per lb.	lb.	1.20 - 1.25
Alcohol, butyl, drums, f.o.b. works	lb.	.25 - .30
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.83 - .
Ethyl, 190 p.f. U.S.P., bbl.	gal.	4.81 - .
Alcohol, methyl (see Methanol)		
Alcohol, denatured, 190 proof		
No. 1, special bbl.	gal.	.51 - .
No. 1, 190 proof, special, dr.	gal.	.45 - .
No. 1, 188 proof, bbl.	gal.	.52 - .
No. 1, 188 proof, dr.	gal.	.48 - .
No. 5, 188 proof, bbl.	gal.	.50 - .
No. 5, 188 proof, dr.	gal.	.44 - .
Alum, ammonia, lump, bbl.	lb.	.03 - .04
Potash, lump, bbl.	lb.	.02 - .03
Chrome, lump, potash, bbl.	lb.	.05 - .06
Aluminum sulphate, com. bags	100 lb.	1.35 - 1.40
Iron free bags	100 lb.	2.35 - 2.45
Aqua ammonia, 26%, drums	lb.	.06 - .06
Ammonia, anhydrous, cyl.	lb.	.28 - .30
Ammonium carbonate, powd. tech., casks	lb.	1.12 - 1.13
Ammonium nitrate, tech., casks	lb.	.09 - .10
Amyl acetate tech., drums	gal.	3.00 - 3.25
Antimony oxide, white, bbl.	lb.	.10 - .10
Arsenic, white, powd., bbl.	lb.	.08 - .08
Arsenic, red, powd., kegs	lb.	1.14 - 1.15
Barium carbonate, bbl.	ton	61.00 - 62.00
Barium chloride, bbl.	ton	80.00 - 82.00
Barium dioxide, 88%, drums	lb.	.17 - .18
Barium nitrate, casks	lb.	.08 - .08
Blanc fixe, dry, bbl.	lb.	.03 - .04
Bleaching powder, f.o.b. wks. drums	100 lb.	1.90 - .
Spot N. Y. drums	100 lb.	2.20 - 2.25
Borax, bbl.	lb.	.05 - .05
Bromine, cases	lb.	.28 - .30
Calcium acetate, bags	100 lb.	3.00 - 3.05
Calcium arsenate, dr.	lb.	.09 - .10
Calcium carbide, drums	lb.	.05 - .05
Calcium chloride, fused, dr. wks. ton	ton	21.00 - .
Gran. drums works	ton	27.00 - .
Calcium phosphate, mono, bbl.	lb.	.06 - .07
Camphor, Jap. cases	lb.	.72 - .73
Carbon bisulphide, drums	lb.	.06 - .06
Carbon tetrachloride, drums	lb.	.07 - .07
Chalk, precip., domestic, light, bbl.	lb.	.04 - .04
Domestic, heavy, bbl.	lb.	.03 - .04
Imported, light, bbl.	lb.	.04 - .05
Chlorine, liquid, tanks, wks. lb.	lb.	.04 - .
Contract, tanks, wks. lb.	lb.	.04 - .
Cylinders, 100 lb. wks. lb.	lb.	.05 - .07
Chloroform, tech., drums	lb.	.30 - .32
Cobalt, oxide, bbl.	lb.	2.10 - 2.25
Copperas, bulk, f.o.b. wks. ton	ton	16.00 - 18.00
Copper carbonate, bbl.	lb.	.15 - .16
Copper cyanide, drums	lb.	.45 - .46
Coppersulphate, dom., bbl., 100 lb. imp. bbl.	100 lb.	4.40 - 4.60
Imp. bbl.	100 lb.	4.25 - .
Cream of tartar, bbl.	lb.	.20 - .21
Epsom salt, dom., tech., bbl.	100 lb.	1.75 - 2.00
Epsom salt, imp., tech., bags	100 lb.	1.15 - 1.25
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.10 - 2.35
Ether, U.S.P., dr.	lb.	.14 - .15
Ethyl acetate, 85%, drums	gal.	.92 - .95

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

Ethyl acetate, 99%, dr.	gal.	\$1.08 - \$1.10
Formaldehyde, 40%, bbl.	lb.	.09 - .09
Fullers earth—f.o.b. mines	ton	7.50 - 18.00
Furfural, works, bbl.	lb.	.25 - .
Fusel oil, ref., drums	gal.	3.25 - 4.00
Fusel oil, crude, drums	gal.	2.50 - 2.75
Glaucers salt, wks., bags	100 lb.	1.20 - 1.40
Glaucers salt, imp., bags	100 lb.	.90 - .95
Glycerine, c.p., drums extra	lb.	.16 - .16
Glycerine, dynamite, drums	lb.	.15 - .16
Glycerine, crude 80%, loose	lb.	.10 - .10
Hexamethylene, drums	lb.	.65 - .75
Lead:		
White, basic carbonate, dry, casks	lb.	.09 - .
White, basic sulphate, casks	lb.	.09 - .
White, in oil, kegs	lb.	.12 - .
Red, dry, casks	lb.	.10 - .
Red, in oil, kegs	lb.	.12 - .
Lead acetate, white crys., bbl.	lb.	.14 - .
Brown, broken, casks	lb.	.13 - .
Lead arsenate, powd., bbl.	lb.	.16 - .18
Lime-Hydrated, bg. wks.	ton	10.50 - 12.50
Bbl. wks.	ton	18.00 - 19.00
Lime, lump, bbl.	280 lb.	3.63 - 3.65
Litharge, comm., casks	lb.	.10 - .10
Lithopone, bags	lb.	.06 - .06
Magnesium carb., tech., bags	lb.	.08 - .08
Methanol, 95%, bbl.	gal.	.80 - .
Methanol, 97%, bbl.	gal.	.82 - .
Methanol, pure, tanks	gal.	.80 - .
Methanol, pure, tanks	gal.	.82 - .
Methyl acetone, t'ks.	gal.	.70 - .75
Nickel salt, double, bbl.	lb.	.09 - .10
Nickel salt, single, bbl.	lb.	.10 - .11
Orange mineral, csk.	lb.	.13 - .14
Phosgene	lb.	.60 - .75
Phosphorus, red, cases	lb.	.70 - .75
Phosphorus, yellow, cases	lb.	.37 - .40
Potassium bichromate, casks	lb.	.09 - .09
Potassium bromide, gran., bbl.	lb.	.22 - .38
Potassium carbonate, 80-85%, calcined, casks	lb.	.05 - .05
Potassium chlorate, powd., lb.	lb.	.07 - .08
Potassium cyanide, drums	lb.	.47 - .52
Potassium, first sort, cask	lb.	.07 - .08
Potassium hydroxide (caustic potash) drums	lb.	.06 - .06
Potassium iodide, cases	lb.	3.65 - 3.75
Potassium nitrate, bbl.	lb.	.06 - .07
Potassium permanganate, drums	lb.	.14 - .14
Potassium prussiate, red, casks	lb.	.35 - .38
Potassium prussiate, yellow, casks	lb.	.18 - .18
Salammoniac, white, gran., casks, imported	lb.	.06 - .06
Salammoniac, white, gran., bbl., domestic	lb.	.07 - .08
Gray, gran., casks	lb.	.08 - .09
Salsoda, bbl.	100 lb.	1.20 - 1.40
Salt cake (bulk) works	ton	18.00 - 20.00
Soda ash, light, 58% flat, bulk, contract	100 lb.	1.25 - .
bags, contract	100 lb.	1.38 - .
Soda ash, dense, bulk, contract, basis 58%	100 lb.	1.35 - .
bags, contract	100 lb.	1.45 - .
Soda, caustic, 76%, solid, drums contract	100 lb.	3.10 - .
Soda, caustic, ground and flake, contracts, dr.	100 lb.	3.50 - 3.85
Soda, caustic, solid, 76% f. a. s. N. Y.	100 lb.	2.90 - 3.05
Sodium acetate, works, bbl.	lb.	.04 - .05
Sodium bicarbonate, bulk	100 lb.	1.75 - .
330-lb. bbl.	100 lb.	2.00 - .
Sodium bichromate, casks	lb.	.07 - .07
Sodium bisulphate (niter cake) ton	ton	6.00 - 7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04 - .04
Sodium chlorate, kegs	lb.	.06 - .07
Sodium chloride	long ton	12.00 - 13.00
Sodium cyanide, cases	lb.	.19 - .22

Sodium fluoride, bbl.	lb.	\$0.08 - \$0.10
Sodium hyposulphite, bbl.	lb.	.02 - .02
Sodium nitrite, casks	lb.	.08 - .08
Sodium peroxide, powd., cases	lb.	.23 - .27
Sodium phosphate, dibasic, bbl.	lb.	.03 - .03
Sodium prussiate, yel. bbl.	lb.	.09 - .10
Sodium salicylic, drums	lb.	.38 - .40
Sodium silicate (40% drums)	100 lb.	.75 - 1.15
Sodium silicate (60% drums)	100 lb.	1.75 - 2.03
Sodium sulphide, fused, 60-62% drums	lb.	.03 - .03
Sodium sulphite, crys., bbl.	lb.	.02 - .03
Strontium nitrate, powd., bbl.	lb.	.10 - .10
Sulphur chloride, yel. drums	lb.	.04 - .05
Sulphur, crude	ton	18.00 - 20.00
At mine, bulk	ton	16.00 - 18.00
Sulphur, flour, bag	100 lb.	2.25 - 2.35
Sulphur, roll, bag	100 lb.	2.00 - 2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 - .08
Tin bichloride, bbl.	lb.	.12 - .
Tin oxide, bbl.	lb.	.48 - .
Tin crystals, bbl.	lb.	.31 - .
Zinc carbonate, bags	lb.	.12 - .14
Zinc chloride, gran, bbl.	lb.	.05 - .07
Zinc cyanide, drums	lb.	.36 - .37
Zinc dust, bbl.	lb.	.08 - .08
Zinc oxide, lead free, bag	lb.	.07 - .
5% lead sulphate, bags	lb.	.07 - .
10 to 35 % lead sulphate, bags	lb.	.07 - .
French, red seal, bags	lb.	.09 - .
French, green seal, bags	lb.	.10 - .
French, white seal, bbl.	lb.	.12 - .
Zinc sulphate, bbl.	100 lb.	3.00 - 3.25

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	\$0.60 - \$0.65
Alpha-naphthol, ref., bbl.	lb.	.70 - .75
Alpha-naphthylamine, bbl.	lb.	.35 - .36
Aniline oil, drums	lb.	.16 - .16
Aniline salt, bbl.	lb.	.22 - .23
Anthracene, 80% drums	lb.	.70 - .75
Anthraquinone, 25%, paste, drums	lb.	.75 - .80
Benzaldehyde U.S.P., carboys f.f.c. drums	lb.	1.50 - .
tech. drums	lb.	1.60 - .
Benzene, pure, water-white, tanks, works	gal.	.25 - .
Benzene, 90%, tanks, works	gal.	.23 - .
Benzidine base, bbl.	lb.	.80 - .82
Benzidine sulphate, bbl.	lb.	.70 - .72
Benzoic acid, U.S.P., kegs	lb.	.82 - .85
Benzoate of soda, U.S.P., bbl.	lb.	.65 - .70
Benzyl chloride, 95-97%, ref. carboys	lb.	.35 - .
Benzyl chloride, tech., drums	lb.	.25 - .
Beta-naphthol, tech., bbl.	lb.	.24 - .25
Beta-naphthylamine, tech.	lb.	.65 - .70
Cresol, U.S.P., drums	lb.	.22 - .26
Ortho-cresol, drums	lb.	.28 - .32
Cresylic acid, 97%, works drums	gal.	.63 - .67
95-97%, drums, works	gal.	.58 - .61
Dichlorobenzene, drums	lb.	.07 - .08
Diethylaniline, drums	lb.	.55 - .
Dimethylaniline, drums	lb.	.36 - .38
Dinitrobenzene, bbl.	lb.	.15 - .17
Dinitrochlorobenzene, bbl.	lb.	.21 - .22
Dinitronaphthalen, bbl.	lb.	.30 - .32
Dinitrophenol, bbl.	lb.	.35 - .40
Dinitrotoluen, bbl.	lb.	.18 - .20
Dip oil, 25%, drums	gal.	.26 - .28
Diphenylamine, bbl.	lb.	.48 - .50
H-acid, bbl.	lb.	.72 - .75
Meta-phenylenediamine, bbl.	lb.	.95 - 1.00
Michler ketone, bbl.	lb.	3.00 - 3.50
Monochlorobenzene, drums	lb.	.08 - .10
Monochlorobenzene, drums	lb.	.95 - 1.10
Naphthalene, flake, bbl.	lb.	.05 - .05
Naphthalene, balls, bbl.	lb.	.06 - .06
Naphthionate of soda, bbl.	lb.	.60 - .65
Naphthionic acid, crude, bbl.	lb.	.60 - .62
Nitrobenzene, drums	lb.	.09 - .09
Nitro-naphthalene, bbl.	lb.	.25 - .30
Nitro-toluene, drums	lb.	.13 - .14
N-W acid, bbl.	lb.	1.00 - 1.05
Ortho-amidophenol, kegs	lb.	2.40 - 2.50
Ortho-dichlorobenzene, drums	lb.	.12 - .13
Ortho-nitrophenol, bbl.	lb.	1.25 - 1.30
Ortho-nitrotoluene, drums	lb.	.11 - .12
Ortho-toluidine, bbl.	lb.	.13 - .14
Para-aminophenol, base, kegs	lb.	1.20 - 1.25
Para-aminophenol, HCl, kegs	lb.	1.30 - 1.40
Para-dichlorobenzene, bbl.	lb.	.17 - .20
Paranitraniline, bbl.	lb.	.68 - .70
Para-nitrotoluene, bbl.	lb.	.58 - .60
Para-phenylenediamine, bbl.	lb.	1.40 - 1.50
Para-toluidine, bbl.	lb.	.72 - .80
Phthalic anhydride, bbl.	lb.	.30 - .34
Phenol, U.S.P., dr.	lb.	.26 - .27
Picric acid, bbl.	lb.	.20 - .22
Pitch, tanks, works	ton	25.00 - 30.00
Pyridine, imp., drums	gal.	4.50 - 4.75
Resorcinol, tech., kegs	lb.	1.30 - 1.40

Resoreinol, pure, kegs.....	lb.	\$1.90 - \$2.00
R-salt, bbl.....	lb.	.55 - .60
Salicylic acid, tech., bbl.....	lb.	.31 - .32
Salicylic acid, U.S.P., bbl.....	lb.	.35 - .36
Solvent naphtha, water-white, tanks.....	gal.	.25 - .26
Crude, tanks.....	gal.	.22 - .23
Gulphanic acid, crude, bbl.....	lb.	.16 - .18
Tolidine, bbl.....	lb.	1.00 - 1.05
Toluidine, mixed, kegs.....	lb.	.30 - .35
Toluene, tank cars, works.....	gal.	.26 - .27
Toluene, drums, works.....	gal.	.30 - .31
Xyldine, drums.....	lb.	.48 - .50
Xylene, 5 deg., tanks.....	gal.	.40 - .41
Xylene, com., tanks.....	gal.	.28 - .29

Naval Stores

Rosin B-D, bbl.....	280 lb.	\$5.50 - \$5.55
Rosin E-I, bbl.....	280 lb.	5.65 - 5.70
Rosin K-N, bbl.....	280 lb.	5.90 - 6.10
Rosin W.G.-W.W., bbl.....	280 lb.	7.00 - 7.60
Wood rosin, bbl.....	280 lb.	5.40 - 5.50
Turpentine, spirits of, bbl.....	gal.	.83 - .84
Wood, steam dist., bbl.....	gal.	.75 - .76
Wood, dest. dist., bbl.....	gal.	.58 - .60
Pine tar pitch, bbl.....	200 lb.	5.50 - 5.60
Tar, kiln burned, bbl.....	500 lb.	10.50 - 10.60
Retort tar, bbl.....	500 lb.	10.50 - 10.60
Rosin oil, first run, bbl.....	gal.	.40 - .41
Rosin oil, second run, bbl.....	gal.	.45 - .46
Rosin oil, third run, bbl.....	gal.	.50 - .51
Pine oil, steam dist., bbl.....	gal.	.60 - .61
Pine tar oil, com'l., bbl.....	gal.	.30 - .31

Animal Oils and Fats

Degras, bbl.....	lb.	\$0.03 - \$0.05
Grease, yellow, loose.....	lb.	.06 - .06
Lard oil, Extra No. 1, bbl.....	gal.	.85 - .86
Lard compound, bbl.....	lb.	.12 - .12
Neatafoot oil 20 deg. bbl.....	gal.	1.26 - 1.27
No. 1, bbl.....	gal.	.86 - .88
Oleo Stearine.....	lb.	.10 - .10
Oleo oil, No. 1, bbl.....	lb.	.12 - .12
Red oil, distilled, d.p. bbl.....	lb.	.08 - .09
Saponified, bbl.....	lb.	.08 - .09
Tallow, extra, loose works.....	lb.	.06 - .06
Tallow oil, acidless, bbl.....	gal.	.82 - .82

Vegetable Oils

Castor oil, No. 3, bbl.....	lb.	\$0.15 - .15
Castor oil, No. 1, bbl.....	lb.	.15 - .15
Chinawood oil, bbl.....	lb.	.12 - .12
Coconut oil, Ceylon, bbl.....	lb.	.09 - .09
Ceylon, tanks, N.Y.....	lb.	.08 - .08
Coconut oil, Ceylon, bbl.....	lb.	.10 - .10
Corn oil, crude, bbl.....	lb.	.11 - .11
Crude, tanks, (f.o.b. mill).....	lb.	.08 - .09
Cottonseed oil, crude (f.o.b. mill), tanks.....	lb.	.08 - .09
Summer yellow, bbl.....	lb.	.11 - .11
Winter yellow, bbl.....	lb.	.11 - .12
Linseed oil, raw, ear lots, bbl.....	gal.	.94 - .94
Raw, tank cars (dom.).....	gal.	.96 - .96
Boiled, ear, bbl (dom.).....	gal.	1.20 - 1.25
Olive oil, denatured, bbl.....	gal.	.09 - .09
Sulphur, (foots) bbl.....	lb.	.07 - .07
Palm, Lagos, casks.....	lb.	.06 - .06
Niger, casks.....	lb.	.09 - .09
Palm kernel, bbl.....	lb.	.11 - .11
Peanut oil, crude, tanks (mill).....	lb.	.14 - .14
Peanut oil, refined, bbl.....	lb.	.14 - .14
Perilla, bbl.....	lb.	.77 - .78
Rapeseed oil, refined, bbl.....	lb.	.11 - .11
Sesame, bbl.....	lb.	.11 - .11
Soya bean (Manchurian), bbl.....	lb.	.09 - .10
Tank, f.o.b. Pacific coast.....	lb.	.10 - .10
Tank, (f.o.b. N.Y.).....	lb.	.10 - .10

Fish Oils

Cod, Newfoundland, bbl.....	gal.	\$0.60 - \$0.62
Menhaden, light pressed, bbl.....	gal.	.56 - .56
White bleached, bbl.....	gal.	.58 - .58
Blown, bbl.....	gal.	.62 - .62
Crude, tanks (f.o.b. factory).....	gal.	.40 - .40
Whale No. 1 crude, tanks, coast.....	lb.	.75 - .76
Winter, natural, bbl.....	gal.	.78 - .79
Winter, bleached, bbl.....	gal.	.78 - .79

Oil Cake and Meal

Coconut cake, bags.....	ton	\$28.00 - 29.00
Cottonseed meal, f.o.b. mills.....	ton	36.00 - 37.00
Linseed cake, bags.....	ton	34.00 - 34.50
Linseed meal, bags, spot.....	ton	39.00 - 41.00

Dye & Tanning Materials

Albumen, blood, bbl.....	lb.	\$0.50 - \$0.55
Albumen, egg, tech, kegs.....	lb.	.95 - .97
Cochineal, bags.....	lb.	.32 - .34
Cutch, Borneo, bales.....	lb.	.04 - .04
Cutch, Rangoon, bales.....	lb.	.13 - .14
Dextrine, corn, bags.....	100 lb.	3.09 - 3.64
Dextrine, gum, bags.....	100 lb.	3.99 - 4.09
Divi-divi, bags.....	ton	40.00 - 42.00
Fustic, sticks.....	ton	30.00 - 35.00
Fustic, chips, bags.....	lb.	.04 - .05
Gambier com., bags.....	lb.	.11 - .12
Logwood, sticks.....	ton	25.00 - 26.00
Logwood, chips, bags.....	lb.	.02 - .03
Sumac, leaves, Sicily, bags.....	ton	170.00 - 180.00
Sumac, ground, bags.....	ton	160.00 - 170.00
Sumac, domestic, bags.....	ton	50.00 - 55.00
Starch, corn, bags.....	100 lb.	3.07 - 3.82
Tapioca flour, bags.....	lb.	.05 - .06

Extracts

Arehil, conc., bbl.....	lb.	\$0.16 - \$0.20
Chestnut, 25% tannin, tanks.....	lb.	.01 - .02
Divi-divi, 25% tannin, bbl.....	lb.	.04 - .05
Fustic, crystals, bbl.....	lb.	.20 - .22
Fustic, liquid, 42° bbl.....	lb.	.08 - .09
Gambier, liq., 25% tannin, bbl.....	lb.	.09 - .10
Hematin, crys., bbl.....	lb.	.14 - .18
Hemlock, 25% tannin, bbl.....	lb.	.03 - .04
Hypernic, solid, drums.....	lb.	.24 - .26
Hypernic, liquid, 51° bbl.....	lb.	.09 - .10
Logwood, crys., bbl.....	lb.	.14 - .15
Logwood, liq., 51° bbl.....	lb.	.08 - .09
Osage Orange, 51° liquid, bbl.....	lb.	.07 - .08
Osage Orange, powder, bg.....	lb.	.14 - .15
Quebracho, solid, 65% tannin, bbl.....	lb.	.05 - .05
Sumac, dom., 51° bbl.....	lb.	.07 - .07

Dry Colors

Blacks-Carbongas, bags, f.o.b. works, contract.....	lb.	\$0.09 - \$0.11
spot, cases.....	lb.	.12 - .16
Lampblack, bbl.....	lb.	.12 - .40
Mineral, bulk.....	ton	35.00 - 45.00
Blues-Bronze, bbl.....	lb.	.38 - .40
Prussian, bbl.....	lb.	.38 - .40
Ultramarine, bbl.....	lb.	.08 - .35
Browns, Sienna, Ital., bbl.....	lb.	.06 - .14
Sienna, Domestic, bbl.....	lb.	.03 - .04
Umber, Turkey, bbl.....	lb.	.04 - .04
Greens-Chrome, C.P. Light, bbl.....	lb.	.28 - .30
Chrome, commercial, bbl.....	lb.	.11 - .12
Paris, bulk.....	lb.	.24 - .26
Reds, Carmine No. 40, tins.....	lb.	4.25 - 4.50
Iron oxide red, casks.....	lb.	.08 - .12
Para toner, kegs.....	lb.	.95 - 1.00
Vermilion, English, bbl.....	lb.	1.30 - 1.35
Yellow, Chrome, C.P. bbls.....	lb.	.17 - .18
Ocher, French, casks.....	lb.	.02 - .03

Waxes

Bayberry, bbl.....	lb.	\$0.21 - \$0.21
Beeswax, crude, Afr. bg.....	lb.	.26 - .27
Beeswax, refined, light, bags.....	lb.	.32 - .34
Beeswax, pure white, cases.....	lb.	.40 - .41
Candelilla, bags.....	lb.	.23 - .23
Carnauba, No. 1, bags.....	lb.	.40 - .40
No. 2, North Country, bags.....	lb.	.29 - .30
No. 3, North Country, bags.....	lb.	.22 - .23
Japan, cases.....	lb.	.22 - .23
Montan, crude, bags.....	lb.	.05 - .06
Paraffine, crude, match, 105-110 m.p., bbl.....	lb.	.05 - .05
Crude, scale 124-126 m.p. bags.....	lb.	.04 - .04
Ref., 118-120 m.p., bags.....	lb.	.05 - .05
Ref., 123-125 m.p., bags.....	lb.	.05 - .05
Ref., 128-130 m.p., bags.....	lb.	.05 - .05
Ref., 133-135 m.p., bags.....	lb.	.06 - .06
Ref., 135-137 m.p., bags.....	lb.	.06 - .07
Stearic acid, aggre pressed, bags.....	lb.	.10 - .10
Double pressed, bags.....	lb.	.11 - .11
Triple pressed, bags.....	lb.	.12 - .12

Fertilizers

Acid phosphate, 16%, bulk, works.....	ton	\$7.50 - \$7.75
Ammonium sulphate, bulk f.o.b. works.....	100 lb.	2.60 - .
Blood, dried, bulk.....	unit	4.10 - 4.15
Bone, raw, 3 and 50, ground.....	ton	26.00 - 28.00
Fish scrap, dom., dried, wks.....	unit	. - .
Nitrate of soda, bags.....	100 lb.	2.55 - .
Tankage, high grade, f.o.b. Chicago.....	unit	2.20 - .
Phosphate rock, f.o.b. mines.....	ton	3.25 - 3.70
Florida pebble, 68-72%.....	ton	6.75 - 7.00
Tennessee, 75%.....	ton	34.55 - .
Potassium muriate, 80%, bags.....	ton	45.85 - .
Potassium sulphate, bags banis 90%.....	ton	26.35 - .
Double manure salt.....	ton	7.22 - .
Kainit.....	ton	7.22 - .

Crude Rubber

Para-Upriver fine.....	lb.	\$0.19 - .
Upriver coarse.....	lb.	.14 - .
Upriver caucho ball.....	lb.	.14 - .
Plantation—First latex crepe.....	lb.	.19 - .19
Ribbed smoked sheets.....	lb.	.18 - .
Amber crepe No. 1.....	lb.	.18 - .19

Gums

Copal, Congo, amber, bags.....	lb.	\$0.09 - \$0.14
East Indian, bold, bags.....	lb.	.13 - .14
Manila, pale, bags.....	lb.	.18 - .19
Pontinak, No. 1 bags.....	lb.	.19 - .20
Damar, Batavia, cases.....	lb.	.22 - .23
Singapore, No. 1, cases.....	lb.	.27 - .27
Singapore, No. 2, cases.....	lb.	.18 - .19
Kauri, No. 1, cases.....	lb.	.58 - .64
Ordinary chips, cases.....	lb.	.21 - .22
Manjak, Barbados, bags.....	lb.	.06 - .09

Shellac

Shellac, orange fine, bags.....	lb.	\$0.56 - \$0.57
Orange superfine, bags.....	lb.	.58 - .
A. C. garnet, bags.....	lb.	.52 - .
Bleached, bonedry.....	lb.	.64 - .65
Bleached, fresh.....	lb.	.53 - .54
T. N., bags.....	lb.	.53 - .54

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec.....	sh. ton	\$300.00 - \$400.00
Asbestos, shingle, f.o.b., Quebec.....	sh. ton	50.00 - 70.00
Asbestos, cement, f.o.b., Quebec.....	sh. ton	20.00 - 25.00
Barytes, grd., white, f.o.b. mills, bbl.....	net ton	16.00 - 17.00
Barytes, grd., off-color, f.o.b. Balt., bbl.....	net ton	13.00 - 14.00
Barytes, floated, f.o.b. St. Louis, bbl.....	net ton	23.00 - 24.00
Bar ytes, crude f.o.b. mines, bulk.....	net ton	8.00 - 8.50
Casein, bbl., tech.....	lb.	.10 - .12
China clay (kaolin) crude, No. 1, f.o.b. Ga.....	net ton	7.00 - 8.00
Washed, f.o.b. Ga.....	net ton	8.50 - 9.00
Powd., f.o.b. Ga.....	net ton	14.00 - 20.00
Crude f.o.b. Va.....	net ton	6.00 - 8.00
Ground, f.o.b. Va.....	net ton	13.00 - 19.00
Imp., lump, bulk.....	net ton	15.00 - 20.00
Imp., powd.....	net ton	45.00 - 50.00
Feldspar, No. 1 f.o.b. N.C. long ton	long ton	7.00 - 7.50
No. 2 f.o.b. N.C. long ton	long ton	4.50 - 5.00
No. 1 Canadian, f.o.b. mill, powd.....	long ton	15.32 - 21.00
Graphite, Ceylon, lump, first quality, bbl.....	lb.	.05 - .06
Ceylon, chip, bbl.....	lb.	.04 - .05
High grade amorphous, crude.....	ton	15.00 - 35.00
Gum arabic, amber, surts, bags.....	lb.	.12 - .12
Gum tragacanth, sorts, bags.....	lb.	.48 - .50
No. 1, bags.....	lb.	1.20 - .
Kieselguhr, f.o.b. Cal.....	ton	40.00 - 42.00
F.o.b. N. Y.....	ton	50.00 - 55.00
Magnesite, calcined, f.o.b. Cal. ton	ton	35.00 - 45.00
Pumice stone, imp., casks.....	lb.	.03 - .40
Dom., lump, bbl.....	lb.	.06 - .08
Dom., ground, bbl.....	lb.	.03 - .05
Silica, glass sand, f.o.b. Ind.....	ton	2.00 - 2.50
Silica, sand blast, f.o.b. Ind.....	ton	2.25 - 3.50
Silica, amorphous, 200-mesh, f.o.b. Ill.....	ton	20.00 - .
Silica, glass sand, f.o.b. Ill.....	ton	2.00 - 2.50
Soapstone, coarse, f.o.b. Vt.....	ton	7.50 - 8.00
Talc, 200 mesh, f.o.b. Vt.....	ton	10.50 - .
Talc, extra.....	ton	. - .
Talc, 200 mesh, f.o.b. Ga.....	ton	8.00 - 10.00
Talc, 325 mesh, f.o.b. New York, grade A bags.....	ton	14.75 - .

Mineral Oils

Crude, at Wells

Pennsylvania.....	bbl.	\$3.25 - \$3.75
Corning.....	bbl.	1.90 - .
Cabell.....	bbl.	1.70 - .
Somerset.....	bbl.	1.80 - .
Illinois.....	bbl.	2.07 - .
Indiana.....	bbl.	2.08 - .
Kansas and Okla. under 28 deg. bbl.	bbl.	.90 - .
California, 35 deg. and up.....	bbl.	1.40 - .

Gasoline, Etc.

Motor gasoline, steel bbls.....	gal.	\$0.20 - .
Naphtha, V. M. & P. dead, steel bbls.....	gal.	.19 - .
Kerosene, ref. tank wagon.....	gal.	.14 - .
Bulk, W.W. delivered, N.Y. gal.	gal.	.08 - .
Lubricating oils:		
Cylinder, Penn., filtered.....	gal.	.30 - .35
Bloomless, 30@31 grav.....	gal.	.21 - .22
Paraffin, pale 885 vis.....	gal.	.16 - .17
Spindle, 200, pale.....	gal.	.22 - .
Petrolatum, amber, bbls.....	lb.	.04 - .04
Paraffine wax (see waxes)		

Refractories

Bauxite brick, 56% Al ₂ O ₃ , f.o.b. Pittsburgh.....	1,000	\$140-\$145
Chrome brick, f.o.b. Eastern shipping points.....	ton	45-47
Chrome cement, 40-50% Cr ₂ O ₃	ton	23-27
40-45% Cr ₂ O ₃ , sacks, f.o.b. Eastern shipping points.....	ton	23.00
Fireclay brick, lat. quality, 9-in. shapes, f.o.b. Ky. wks.....	1,000	42-45
2nd. quality, 9-in. shapes, f.o.b. wks.....	1,000	35-38
Magnesite brick, 9-in. straight (f.o.b. wks.).....	ton	65-68
9-in. arches, wedges and keys.....	ton	80-85
Scrap and splits.....	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district.....	1,000	48-50
Silica brick, 9-in. sizes, f.o.b. Birmingham district.....	1,000	48-50
F.o.b. Mt. Union, Pa.....	1,000	38-40
Silicon carbide refract. brick, 9-in.....	1,000	1,180.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N. Y.....	ton	\$200.00 - .
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Ferrochromium, per lb. c.i.		
Cr, 1-2% C.....	lb.	\$0 30 -.....
4-6% C.....	lb.	.11 -.....
Ferromanganese, 78-82% Mn, Atlantic seabd.		
duty paid.....	gr. ton	107.50 -.....
Spiegelisen, 19-21% Mn.....	gr. ton	36.00 - 38.00
Ferromolybdenum, 50-60% Mo, per lb. Mo.....	lb.	2.00 - 2.25
Ferrosilicon, 10-12% Si.....	gr. ton	41.50 - 46.50
50%.....	gr. ton	75.00 -
Ferrotungsten, 70-80% per lb. of W.....	lb.	.90 - .93
Ferro-uranium, 35-50% of U, per lb. of U.....	lb.	4.50 -
Ferrovanadium, 30-40% per lb. of V.....	lb.	3.50 - 4.00

Ores and Semi-finished Products

Bauxite, dom. crushed, dried, f.o.b. shipping points.....	ton	\$5.50 - \$8.75
Chrome ore, Calif. concentrates, 50% min. Cr ₂ O ₃	ton	22.00 -
C.i.f. Atlantic seaboard.....	ton	19.00 - 22.00
Coke, f.dry., f.o.b. ovens.....	ton	4.50 - 5.00
Coke, furnace, f.o.b. ovens.....	ton	3.25 - 3.40
Fluorspar, gravel, f.o.b. mines, Illinois.....	ton	23.50 -
Ilmenite, 52% TiO ₂ Va.....	lb.	.014 -
Manganese ore, 50% Mn, c.i.f. Atlantic seaport.....	unit	.42 - .46
Manganese ore, chemical (MnO ₂).....	ton	75.00 - 80.00
Molybdenite, 85% MoS ₂ , per lb. MoS ₂ , N. Y.....	lb.	.80 -
Monazite, per unit of ThO ₂ , c.i.f. Atl. seaport.....	lb.	.06 - .08
Pyrites, Span., fines, c.i.f. Atl. seaport.....	unit	.114 - .12
Pyrites, Span., furnace size, c.i.f. Atl. seaport.....	unit	.114 - .12
Pyrites, dom. fines, f.o.b. mines, Ga.....	unit	.12 -
Rutile, 94-96% TiO ₂	lb.	.12 - .15
Tungsten, scheelite, 60% WO ₃ and over.....	unit	9.25 -
Tungsten, wolframite, 60% WO ₃	unit	9.00 - 9.25
Uranium ore (carnotite) per lb. of U ₃ O ₈	lb.	3.50 - 3.75
Uranium oxide, 96% per lb. U ₃ O ₈	lb.	12.25 - 2.50
Vanadium pent oxide, 99%.....	lb.	2.00 - 14.00
Vanadium ore, per lb. V ₂ O ₅	lb.	1.00 - 1.25
Zircon, 99%.....	lb.	.06 - .07

Non-Ferrous Metals

Copper, electrolytic.....	lb.	\$0.121 - \$0.124
Aluminum, 98 to 99%.....	lb.	.27 - .28
Antimony, wholesale, Chinese and Japanese.....	lb.	.081 - .084
Nickel, 99%.....	lb.	.27 - .30
Monel metal, shot and blocks.....	lb.	.32 -
Tin, 5-ton lots, Straits.....	lb.	.424 -
Lead, New York, spot.....	lb.	.07 -
Lead, E. St. Louis, spot.....	lb.	.0690 -
Zinc, spot, New York.....	lb.	.0610 -
Zinc, spot, E. St. Louis.....	lb.	.0575 -
Silver (com. mercantile).....	oz.	.67 -
Cadmium.....	lb.	.60 -
Bismuth (500 lb. lots).....	lb.	2.35 - 2.40
Cobalt.....	lb.	2.50 - 3.00
Magnesium, ingots, 99%.....	lb.	.90 - .95
Platinum, refined.....	oz.	116.00 -
Iridium.....	oz.	260.00 - 270.00
Palladium.....	oz.	78.00 - 83.00
Mercury.....	75 lb.	73.00 - 74.00
Tungsten powder.....	lb.	.95 - 1.00

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled.....	19.25
Copper bottoms.....	29.25
Copper rods.....	19.75
High brass wire.....	17.75
High brass rods.....	15.00
Low brass wire.....	19.50
Low brass rods.....	20.50
Brazed bronze tubing.....	24.34
Seamless copper tubing.....	22.75
Seamless high brass tubing.....	21.50

OLD METALS—The following are the dealers purchasing prices in cents per pound

Copper, heavy and crucible.....	10.50 @ 10.75
Copper, heavy and wire.....	10.00 @ 10.124
Copper, light and bottoms.....	8.50 @ 8.624
Lead, heavy.....	5.674 @ 5.874
Lead, tea.....	3.75 @ 4.00
Brass, heavy.....	6.00 @ 6.25
Brass, light.....	4.75 @ 4.874
No. 1 yellow brass turnings.....	6.50 @ 6.75
Zinc scrap.....	3.50 @ 3.75

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by 1/2 in. and larger, and plates 1/2 in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes.....	\$3.49	\$3.49
Soft steel bars.....	3.49	3.49
Soft steel bar shapes.....	3.59	3.59
Soft steel bands.....	4.39	4.39
Plates, 1/2 to 1 in. thick.....	3.59	3.59

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Alabama

BIRMINGHAM—W. H. Kettig, Birmingham, and associates have perfected plans for the organization of a chemical fertilizer company, a project in which the local Chamber of Commerce has been interested, and will begin work at once on a new plant. A tract of 11 acres of land has been secured. It will comprise a main 2-story building and several 1-story structures, with estimated cost placed at \$300,000. A general contract has been awarded to the Inglenook Construction Co., Birmingham. The machinery installation will be arranged for at an early date. The initial works will give employment to about sixty men.

Arizona

GLENDAL—R. P. Davie and O. P. Johnson, 507 Latham St., Phoenix, Ariz., are perfecting plans for the erection of a cottonseed oil mill on local site, recently acquired, to be operated in connection with a cotton ginning plant at the same location. The project will involve in excess of \$40,000, including equipment.

AJO—Barthoff & Brown, Ajo, have acquired under lease the Allison gold mine, located in the Baboquivari Mountains, south of the city, and will commence operations at the plant at an early date. Plans are under way for the installation of a cyanide plant, as well as a new mill, the latter to be equipped for an initial output of about 20 tons per day.

YUCCA—The Signal Mines Co., C. H. Maxcy, has work in progress on a new volatilization plant at its mining properties, for the treating of complex ores, and expects to have the mill ready for service at an early date. A new flotation plant has recently been opened at the property.

Arkansas

WHITECLIFFS—The Krippendorf - Tuttle Whitecliffs Produce Co. is said to have preliminary plans under way for the erection of a new local plant for the manufacture of asphalt fillers, agricultural limestone specialties, etc., to develop an output of about 2,000 bbl. per day. The majority of the equipment will be electrically operated. Martin Walsh is manager.

California

TORRANCE—The Western Sheet Glass Co. has tentative plans under advisement for the construction of a new tank at its local works, with installation to include eight sheet glass drawing machines and auxiliary equipment. It is purposed to have the unit ready for service by the close of the year. The company has been making improvements and repairs on its present 400-ton tank, and expects to place the unit in operation during July. J. W. Patterson is one of the heads of the company.

Florida

BRADENTOWN—The City Council has authorized the immediate preparation of plans for the proposed municipal artificial gas plant, and expects to award contract for the installation at an early date. The J. B. McCrary Co., Atlanta, Ga., is engineer.

DUNNELLON—The Dunnellon Oil Co. has acquired a local tract of land and plans for the erection of a new oil storage and distributing plant. A number of tanks and auxiliary equipment will be installed.

JACKSONVILLE—The Florida Machine & Foundry Co., 1561 West Church St., has perfected plans for a number of additions to its plant, to include a 1-story foundry, 60x120 ft., to be equipped for the production of iron and steel castings. F. G. Russell, Jr., is general manager.

PLANT CITY—The Osceola Fertilizer Co., Jacksonville, Fla., has leased property at Palmer and Haynes Sts., and will have plans drawn for the erection of a 1-story branch works.

Georgia

ATLANTA—The board of trustees, Emory University, is considering tentative plans for the erection of a new chemistry building at the institution, with cost estimated at \$150,000, including laboratory and other equipment.

Idaho

TWIN FALLS—W. J. Millsap has arranged for the operation of a plant at 664 Main Ave., for the manufacture of cement tile products, primarily for drainage service. It is expected to expand the initial works and develop maximum capacity.

Indiana

INDIANA HARBOR—The Inland Steel Co., Chicago, Ill., has work in progress on additions and improvements at its local mills for extensive increase in the production and finishing capacity. The entire program will involve about \$5,000,000.

Illinois

CHICAGO—The Tidewater Oil Sales Corp., 3433 So. Racine Ave., has acquired property at 1455 West 37th St., totaling about 40,000 sq. ft., as a site for a new storage and distributing plant. The works will include a main 2-story building, 87x90 ft., and 1-story tank plant, 55x91 ft. About fourteen steel storage tanks will be installed, with auxiliary equipment.

Iowa

CEDAR RAPIDS—Penick & Ford, Ltd., Whitney Bldg., New Orleans, La., manufacturer of sugar products, etc., has awarded a general contract to the Foster Engineering Service Co., Indianapolis, Ind., for the erection of the first unit of its proposed local sugar refinery, for crystal sugar production, estimated to cost about \$250,000. Other awards for additional units will be made at an early date. Fred Friedline, Kentland, Ind., is architect and engineer.

Maryland

AMCELLE—The American Cellulose & Chemical Mfg. Co. has commenced the erection of four additional buildings at its local plant, for which a general contract was awarded recently to the Austin Co., Philadelphia, Pa., and plans for the early installation of equipment. One of the structures will be used as an oil-extraction works, another as a research laboratory, the third for a water treatment and filtration plant, and the fourth building for storage purposes. The company has lately completed the construction of a number of main buildings for artificial silk production, with investment of approximately \$1,000,000. Arthur J. Fitch is works manager.

BALTIMORE—The Seaboard Terminal Corp., care of Jerome Sloman, Union Trust Bldg., attorney, has awarded a general contract to the Sanford & Brooks Co., Commerce and Water Sts., for the erection of the initial units of its proposed oil refining and compounding plant at Curtis Bay. Work on this part of the plant will cost in excess of \$250,000, with equipment, and will be placed under way at once. One of the buildings will be used for lubricating oil production. The company will be operated under the direction of the Baltimore Terminal Co., organized as a holding company.

Michigan

GREENVILLE—In connection with the erection of a number of additions to its plant, the Gibson Refrigerator Co., will build a 2-story addition to the porcelain enameling department, used for the manufacture of linings, to be 60x215 ft. Equipment will be installed at an early date.

CALUMET—The Arcadian Mining Co. has tentative plans under consideration for the installation of a new surface plant, to replace that at the New Baltic shaft destroyed by fire a number of months ago. It will consist of boilers, one 30-drill compressor, hoisting machinery for a depth of 4,000 ft., and auxiliary apparatus, estimated to cost \$50,000.

Missouri

ST. GENEVIEVE—The Bluff City Lime Co., E. Olsen, general manager, has preliminary plans under advisement for the installation of a new plant on local site for the production of hydrated lime. Details will be arranged at an early date.

EDINA—The Field Soap Co., recently organized, plans for the operation of a local plant for the manufacture of soaps, washing powders, etc., with initial output of about 30,000 lb. per day. F. W. Field is president.

Nebraska

STROMSBURG—The Sunshine Soap Co., Linwood, Kan., is reported to have preliminary plans under way for the establishment of a branch plant on local site, estimated to cost in excess of \$25,000, with equipment. It will be used for the manufacture of soaps, cleansers, etc.

New Jersey

TRENTON—Fire, June 12 destroyed a portion of the plant of the Hermetite Corp., Pennington Rd., Brookfield, manufacturer of chemical specialties, textile finishers, etc., with loss estimated at close to \$70,000, including equipment. It is expected to rebuild at once.

NEWARK—The Newark Sugar Refining Co., recently formed with a capital of \$5,000,000, and temporary office at Room 526, 765 Broad St., has plans under way for the erection of a new refinery and distributing plant on site at Port Newark, for which negotiations are under way with the city for purchase, consisting of a tract of 8 acres of land. It will comprise a number of units, estimated to cost \$1,500,000, with equipment. Adolph Segal, Philadelphia, Pa., heads the new organization.

CAMDEN—J. Eavenson & Sons, Inc., Delaware Ave. and Penn St., manufacturer of textile and other soaps, washing powders, etc., plan for the rebuilding of the portion of its plant destroyed by fire, June 10, with loss estimated at \$50,000, including equipment. The works consist of four buildings, of which one was affected.

New York

GLOVERSVILLE—The United States Feldspar Co., C. H. Peddrick, Jr., 170 Broadway, New York, head, has tentative plans under consideration for the construction of a new grinding mill for commercial feldspar production, on local site, estimated to cost \$150,000, with equipment.

SYRACUSE—Fire, June 12, destroyed a portion of the pottery of the Iroquois China Co., Solvay, near Syracuse, with loss estimated at \$50,000, with machinery. It is planned to rebuild.

North Dakota

FARGO—The Holly Sugar Co., Colorado Springs, Colo., manufacturer of beet sugar, is reported to be planning for the construction of a new mill in the Red River Valley, near Fargo, with estimated cost in excess of \$500,000, including equipment.

Ohio

BELLAIRE—The Imperial Window Glass Co. has awarded a contract to the Simplex Engineering Co., Washington, Pa., for alterations and improvements in its plant, including rebuilding of furnace, tanks and producer, and other work. Additional equipment will be installed.

CINCINNATI—The Cincinnati Steel Castings Co., 1220 Queen City Ave., has plans in progress for a 1-story addition, for which bids will be asked at an early date. Martin Fisher, Brighton Bank Bldg., is architect.

Pennsylvania

PHILADELPHIA—Continuing expansion at its plant on Weaccocoe Ave., the Pennsylvania Salt Mfg. Co., Widener Bldg., has taken bids on general contract for extensions and improvements in an existing structure, estimated to cost in excess of \$24,000. Plans were filed recently for a 1-story addition, and work is under way.

Tennessee

CHATTANOOGA—The Ross-Meehan Foundries, Carter St., manufacturer of gray iron castings, is said to have plans under way for the erection of a 1-story foundry, 120x200 ft., estimated to cost close to \$25,000, including equipment.

CHATTANOOGA—The Tennessee Paper Mills, Inc., is perfecting plans for complete mill electrification, and will install additional power equipment, including generators, motors, etc.

Texas

PARKS (Stephens County)—The Coltexo Corp., operating a local carbon black plant, has made application for permission to construct and operate an addition, to double, approximately, the present capacity. The expansion is estimated to cost about \$50,000, including equipment.

DALLAS—The American Acid Works, Inc., 3905 Crutcher St., recently organized, has plans for the erection of a new local plant, 35x80 ft., for the manufacture of sulphuric acid. The company is in the market for equipment and purposes to make purchases at an early date. F. E. Ormsby, Merchants Bank Bldg., is president.

HOUSTON—The United Central Oil Co., will make extensions and improvements in its local refining plant on the ship channel for considerable increase in output. A new storage and distributing plant will also be constructed on site near the city. The entire expansion is estimated to cost about \$325,000, including equipment. M. C. Ehlen is vice-president in charge.

EL PASO—Joseph T. Newburger, head of the Newburger Cotton Co., Memphis, Tenn., and associates have organized the El Paso Compress & Fumigation Co., Inc., to construct and operate a local fumigation plant and cotton compress works, estimated to cost \$250,000, with machinery. Work will begin at an early date. It is said that L. J. Ivey, Fabens, Tex., will be president of the new company.

Wisconsin

MILWAUKEE—The Retailers Tallow & Calfskin Association, 2322 State St., Jacob Hern, president, has revised plans in preparation for a new rendering plant on Muskego Ave., to cost \$75,000, with equipment.

New Companies

STANDARD AMERICAN GLASS CO., Los Angeles, Calif.: to operate a local sheet glass plant; \$1,000,000. Incorporators: F. A. H. P. and W. L. Dixon. Representative: Glen Behymer, 1215 March-Strong Bldg., Los Angeles.

WIGGINS CHEMICAL CO., Winchester, Ky.: chemicals and chemical byproducts; \$100,000. Incorporators: D. C. Wiggins, William J. Baxter and H. H. Moore, all of Winchester.

HI-PRAX CO., INC., Minneapolis, Minn.: high-temperature cement and kindred specialties; \$50,000. Ralph B. Beal, 4624 Bryant Ave., Minneapolis, is the principal incorporator.

IONIA METAL POLISH CO., Ionia, Mich.: polishes for metal, wood and other materials; nominal capital \$5,000. Incorporators: Samuel M. Stowell, Edward C. Hansen, and Chester C. Black, all of Ionia.

ALLEGHENY CHEMICAL & PRODUCTS CO., Camden, N. J.: care of the New Jersey Corporation Guarantee & Trust Co., 304 Market St., Camden, representative; to manufacture chemicals and affiliated products; \$350,000.

AVON LEATHER CO., INC., Avon, Mass.: leather products; \$50,000. George W. Slocum is president, and Minnie I. Nelson, 22 Milton St., Brockton, Mass., treasurer.

SPRINGFIELD PLATING & MIRROR CORP., Springfield, O.: mirrors and other glass products; \$10,000. Incorporators: H. J. J. P. and Trace M. Kirchwehm, all of Springfield.

GIANT PAINT CORP., Phoenix, Ariz.: paints, varnishes, etc.; \$1,000,000. Incorporators: Raymond Allee, Chet Williams and Dean Woodward, all of Phoenix. The same incorporators have also chartered the Giant Paint Products Co., with capital of \$100,000, as an affiliated organization.

CHIKLAX CHEMICAL PRODUCTS CORP., Brooklyn, N. Y.: chemicals and chemical byproducts; nominal capital \$5,000. Incorporators: N. Goodman and G. Israel. Representative: P. Brand, Woodhaven, L. I., attorney.

UNIVERSAL POLISH & MFG. CO., 911 Camp St., Dallas, Tex.: polishes, compounds, etc.; \$30,000. Incorporators: W. Y. Hughes, J. J. Cunningham and J. W. Armstrong, all of Dallas.

EUREKA REFINING CO., Los Angeles, Calif.: refined petroleum products; \$1,000,000. Incorporators: E. L. and E. W. Fauley, and M. P. Bush. Representative:

Hahn, Hahn & Landreth, Central Bldg., Pasadena, Calif., attorneys.

MIDDLESEX DUCCO CO., South River, N. J.: paints, oils, varnishes, etc.; \$25,000. Incorporators: Kenneth I. Tredwell, Louis Breuer and Alfred D. Heyl. Representative: George L. Burton, South River.

INDUSTRIAL CHEMICAL LABORATORIES, INC., Omaha, Neb.: chemicals and chemical products; \$10,000. Incorporators: L. H. Mattson, J. E. Clarke and J. E. Clarke, all of Omaha.

PATBOARD RUBBER CO., New York, N. Y.: rubber products; \$20,000. Incorporators: G. W. and G. S. Knapp, and C. F. Walden. Representative: Phillips & Avery, 41 Park Row, New York.

VITAFORT CO., Atlantic City, N. J.: chemicals and chemical compounds; \$50,000. Incorporators: R. L. Glavin, Horace C. Garrison and John F. Ellenberg, 3200 Atlantic Ave., Atlantic City. The last noted is representative.

PEACOCK REFINING CO., Los Angeles, Calif.: refined petroleum products; \$150,000. Incorporators: Paul Cordova, Russell Parsons and C. N. Beerman. Representative: Loewenthal, Collins & Loewenthal, 1111 Van Nuys Bldg., Los Angeles, attorneys.

MUSCLE SHOALS PORTLAND CEMENT CO., Sheffield, Ala.: portland cement; \$100,000. Incorporators: Thurmond Harris, Samuel W. Kendall and J. C. Harris, all of Sheffield.

GRASELLI DYESTUFF CO., Cleveland, O.: dyestuffs, chemicals, etc.; \$4,000,000. Organized by officials of the Graseelli Chemical Co., Guardian Bldg., Cleveland, to be operated as a subsidiary.

STANDARD SHALE CHEMICAL CO., Wilmington, Del.: care of the United States Corporation Co., Dover, Del., representative; chemical products; \$10,000,000.

GLOBE LEATHER CO., Boston, Mass.: leather products; \$25,000. David Lushan is president; and Samuel D. Mussman, 9 Duke St., Dorchester, Mass., treasurer and representative.

WALKER PAINT & VARNISH CO., 154 Wegman Parkway, Jersey City, N. J.: organized; paints, varnishes, oils, etc. Harold Denson, address noted, is head.

GRANT PETROLEUM CO., El Dorado, Ark.: refined petroleum products; \$100,000. Incorporators: James A. Plotner, H. J. Ginsberg and Charles M. Pynes, all of El Dorado.

WATERVLIET IRON & BRASS FOUNDRY, INC., Colonie (Albany), N. Y.: iron, brass, bronze and other metal castings; \$10,000. Incorporators: A. W. Meyer, R. S. Tees and J. C. Rohleder. Representative: E. McLean, Watervliet, attorney.

WESTERN CHEMICAL CORP., Houston, Tex.: chemicals and chemical byproducts; \$100,000. Incorporators: C. F. Wood, J. W. Canada, and O. C. Behae, 1212 Arlington St., Houston.

Industrial Notes

At a meeting of the CUBA CANE SUGAR CORP., New York, F. Gerard Smith was elected executive vice-president, in charge of operations. Miguel Arango, heretofore general manager, has resigned from that office, which will be abolished, becoming consultant vice-president and a member of the board of directors.

Announcement is made of the taking over by the KENTUCKY ALCOHOL CORP. of the entire alcohol business and properties formerly controlled by the Kentucky Distilleries & Warehouse Co. No change is made in the organization or personnel of the alcohol business, and Sid Klein will continue as vice-president in charge of sales. This change of corporate ownership is in accord with the plans of organization of the National Distillers Products Corp., which latter company has taken over the assets of the United States Food Products Corp.

THE MOORE STEAM TURBINE CORP., Wells-ville, N. Y., announces the appointment of M. D. Church as general manager, as of June 1. He was graduated from Syracuse University in 1906, and was later in the employ of the Kerr Turbine Co. for 6 years, during which time he served as assistant chief engineer and factory superintendent under the late J. L. Moore. For the last 9 years Mr. Church has acted as chief engineer for the Terry Steam Turbine Co.

GEORGE R. JOHNSON has resigned as president of the Kelly Island Lime & Transport Co., Cleveland, O., to take up other business interests in the East. John A. Kling continues as chairman of the board of directors of the company.

B. G. DAWES has been re-elected president of the Pure Oil Co., Columbia, O., and also re-elected a director of the company.